Rice Today

www.irri.org

International Rice Research Institute

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GRiSP

Blueprint for a greener revolution

No rust for rice

Rice in the city

Greener rice

Quality matters in Africa

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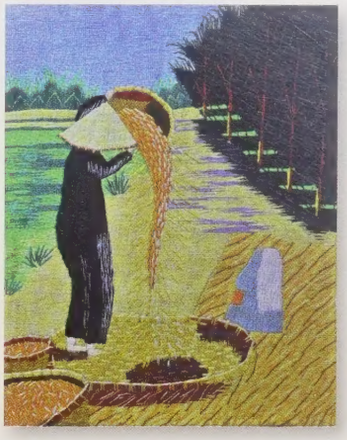

On the cover:
Using a palette of threads, an anonymous artist depicts a Vietnamese woman winnowing rice in this traditional hand-embroidered picture. Hand embroidery is a 700-year-old art form in Vietnam, a country where its economic progress has been driven by its other tradition—rice farming. Vietnam's adoption and adaption of rice technologies has helped it become a major rice exporter. Now, with the advent of the Global Rice Science Partnership (GRiSP), it is hoped that other rice-producing countries in Asia, Africa, and Latin America will benefit.

Rice Today is published by The Rice Trader Inc. (TRT) in association with the International Rice Research Institute (IRRI).

TRT, for 21 years, has brought subscribers crucial, up-to-the-minute information on rice trade through its weekly publication, *The Rice Trader.* Acknowledged as the only source of confidential information about the rice market, this weekly summary of market data analysis has helped both the leading commercial rice companies and regional government officials make informed decisions, which are critical in today's market.

IRRI is the world's leading international rice research and training center. Based in the Philippines and with offices in 13 other countries, IRRI is an autonomous, nonprofit institution focused on improving the well-being of present and future generations of rice farmers and consumers, particularly those with low incomes, while preserving natural resources. It is one of the 15 nonprofit international research centers supported, in part, by members of the Consultative Group on International Agricultural Research (CGIAR – www.cgiar.org) and a range of other funding agencies.

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Getting a grasp on GRiSP and the future of rice science

It is with great delight that I report to you that the Global Rice Science Partnership (GRiSP) was successfully launched as the first new Consultative Group on International Agricultural Research (CGIAR) Research Program at the Third International Rice Congress (IRC2010) last November in Vietnam.

GRiSP marks a new era in rice science—one that outlines a path through which, for the first time, the world can better coordinate its approach to rice science. Through GRiSP, rice research agencies can pool resources, apply their expertise strategically, and collaborate even more in relation to research and its delivery to help poor rice farmers across the world.

By 2035, GRiSP has the potential to contribute significantly to lowering rice prices and reducing global poverty by more than 10%, help reduce greenhouse gas emissions, and save more than 1 million hectares of natural ecosystems from being converted to rice production. (Read more about GRiSP in *Blueprint for a greener revolution* on pages 18-21.)

With the theme Rice for Future Generations, IRC2010 was the perfect venue for the launch of GRiSP. Incredible sharing of rice research and ideas occurred and, in this issue, we feature a group of stories outlining some of the highlights and activities of the event.

Further tied into our GRiSP highlight, the *Grain of Truth* column features Latin America as a significant partner in the mega-program. It particularly discusses the benefits of sharing expertise and experiences to achieve the global goal of ensuring food security for each and every person.

Africa underlines the necessity to boost local production—in not only quantity but also quality—to reduce the region's dependence on rice imports.

Speaking of increasing production, it is well worth knowing how much yield and yield stability have improved since the 1960s as presented in the *Maps* section. It is interesting to note that we still have much room for improvement.

Of course, production is never without challenges. But, the important thing is how we respond to those challenges. In this issue, we take a look at the rat problem troubling the many farmers in the northern region of the Philippines. IRRI's rodent experts, headed by Dr. Grant Singleton, take us on a journey to the Mountain Province to discover both "good" and "bad" rat species and to work with a local community to adopt practices that help reduce rat damage in rice crops.

In our continued effort to highlight countries IRRI works in, this time we focus on India.

Another country that has garnered attention is Singapore—a very urban nation dependent on rice imports. Singapore is taking on a role in raising awareness about rice—an integral part of Asia's diet and culture. It is now also being eyed as a potential home for a rice futures exchange as mentioned in the task force report *Never an Empty Bowl: Sustaining Food Security in Asia.* According to Samarendu Mohanty, IRRI senior economist, a rice futures exchange is one of the essential ingredients in helping keep rice prices stable in the long term. In his *Rice Facts* article, Dr. Mohanty also observes that freeing up the market could help buffer the fluctuations in rice prices observed again recently.

Finally, it is a pleasant surprise to see that nine World Food Prize laureates have had a connection with IRRI—a reminder that rice science is having an impact where it really matters. We hope this continues through GRiSP and all our rice science efforts.

Achim Dobermann

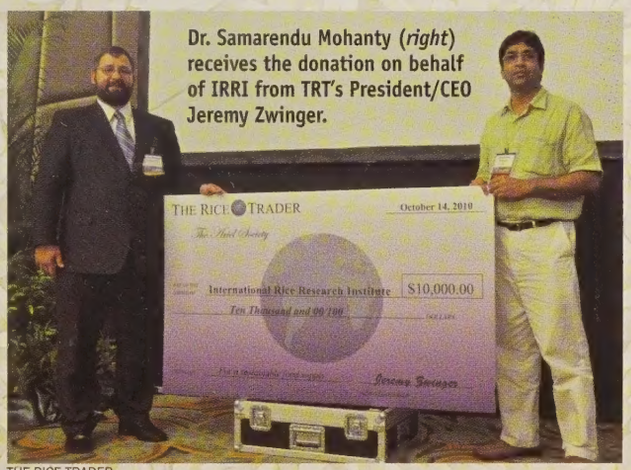
(From *left* to *right*) Alain Ghesquière, head of the IRD Genome and Development Research Unit; Marco Wopereis, AfricaRice deputy director general and director of research for development; Carlos Pérez del Castillo, chair of CGIAR Consortium board; Achim Dobermann, IRRI deputy director general for research; Robert Habib, head of the CIRAD Department of Tropical Production and Processing Systems; and César Martínez, CIAT rice program leader, discussed GRiSP during IRC2010. See http://snipurl.com/1orsvy for selected YouTube video clips of the GRiSP discussion.

Hidden Treasure*

In honor of the International Rice Research Institute's (IRRI) 50 years of dedication to rice research and development, The Rice Trader (TRT) donated US$10,000 to IRRI during the TRT World Rice Conference in Phuket, Thailand, last 12-14 October. This amount is not much compared to the great wealth of others, but I am nonetheless glad to be able to give back to the Institute that has given so much to the world.

In the next 50 years

Oftentimes, in the midst of celebrating and looking back at accomplishments, we take a pause in life. It is as if one has finally reached the top of the mountain after an arduous climb, and takes time to sit down, rest, and reflect on the journey. Perhaps, this is the last hurrah of this 50-year celebration. And so, allow me to once again humbly honor those who have dedicated their careers to propel great revolutions in agriculture. The time and effort they have devoted to ensure we have food on our plate is commendable. It is because of them that we—the rice industry and IRRI—now stand where we are, celebrating the many hard-won achievements in food production.



Dr. Samarendu Mohanty (*right*) receives the donation on behalf of IRRI from TRT's President/CEO Jeremy Zwinger.

THE RICE TRADER

So, what has occurred during the last 50 years? Prior to 1960, we were still "mentally" moving away from the devastation of World War II. At that time, the world had a great sense of rebuilding lives and a renewed sense of hope for a better future. The population then was around a staggering 3 billion and questions abounded concerning how to push for industrial and technological revolution, while at the same time sustaining agricultural growth to feed the growing number of people. Political turmoil and shifts in global power followed and brought about socioeconomic changes. Yet, in all of this, the world had to look forward to the progression of the human race. Problems will always be there, but humans have been blessed with the ability to solve challenges. I believe that we will continue to triumph over more challenges in the future.

In the next 50 years, what must we do as we move forward and what challenges lie ahead of us? The simple answer is to sustain the achievements seen in the last half a century, and even push for more advancement to increase our food supply. The world's population will continue to grow dramatically. But, the amount of land used for food production is reaching its maximum capacity, and so we must focus on using land resources more efficiently, boosting yields, and reducing postharvest losses. Needless to say, we need to find new, better, and more sustainable ways to increase our food supply, and at the same time keep prices in check to ensure that everyone can still have access to food. Energy is yet another factor that must be considered on the road ahead as it will surely leave a trail, particularly in the cost of fertilizers, a valued input to boost yields.

Working diligently to make sure the world has ample food supplies and remains safe from fears of food shortages is a priority. One thing is certain: the challenges will be great. Nonetheless, we are also sure that some people will stand up to these challenges knowing that their sacrifices today will be rewarded much later—to the benefit of future generations. For me, quiet success outweighs the need for public accolades.

With this, I would like to end by wishing everyone a happy new year. May 2011 bring us more blessings—but, more importantly, that we understand the blessings that have already been bestowed upon us.

Jeremy Zwinger

Jeremy Zwinger
Publisher

* The opinions expressed here are those of the author and do not necessarily reflect the views of the International Rice Research Institute.

Korea releases tasty new pest-proof rice

South Korea has released *Anmi,* a new pest- and disease-resistant japonica rice with high palatability. It is the latest output from Korea's collaboration with IRRI to help Korean farmers boost rice production.

Anmi, meaning "safe and delicious rice" in Korean, has high resistance to a destructive rice pest—the brown planthopper (BPH)—as well as to a range of diseases such as blast, bacterial blight, and rice stripe virus. It has an average milled rice yield potential of more than 5.8 tons per hectare, which is 11% more than the best check japonica variety, *Hwaseongbyeo*, currently grown in Korea.

"We have been working on improving the resistance of japonica rice to brown planthoppers to help Korean farmers since 2002," said IRRI plant breeder Dr. Kshirod Jena. "In 2004, we had a significant breakthrough when we were able to locate the gene *Bph18* for BPH resistance.

"We were then able to add this gene to a BPH-susceptible elite japonica rice variety *Junambyeo*, successfully employing the modern rice-breeding technique called 'marker-assisted breeding' for the first time ever in japonica rice," he added.

In 2009, the Rural Development Administration (RDA) of Korea reported swarms of BPH in 10 counties along the western coast of the Korean peninsula. Farmers who grow *Anmi* will likely experience less damage to their rice crops from such BPH pest outbreaks while reducing their pesticide use.

Korea's Variety Development Committee of the National Institute of Crop Science, RDA, released *Anmi* on 6 December 2010. It is the result of a collaborative research project between IRRI and RDA.

ANMI, SOUTH Korea's new pest- and disease-resistant japonica rice variety, promises better crop output for farmers.

JUNG-PIL SUH

Indonesians urged to eat less rice

The Indonesian government has launched an ambitious drive to wean people off rice.

Welfare Ministry Secretary General Indroyono Soesilo said, "We urge Indonesians to kick their habit of eating rice. We need to diversify our diets.

"Indonesia produces 66 kinds of other carbohydrates, such as corn, sago, cassava, sweet potato, potato, and others," he added. "All of these can replace rice for two out of three meals a day."

The average Indonesian consumes more than 100 kilograms of rice a year and the country has 240 million people to feed.

Improving farming techniques and a postcolonial food security drive have seen the country go from being the world's biggest rice importer in the 1960s to being self-sufficient now.

But, while rice is plentiful and cheap, the government is worried that the nation is becoming too dependent on a single crop.

Rice is vulnerable to shifting global weather patterns, such as this year's unseasonal rains linked to cooler sea-surface temperatures in the Pacific, known as the La Niña effect.

Other concerns include population growth and the shrinking availability of arable land because of urbanization and rising sea levels from global warming, which the government fears could slash Indonesia's rice production.

Source: Agence France Presse (AFP)

INDONESIA TRIES to diversify its food basket to reduce the nation's reliance on rice.

IRRI

Uganda to double rice production

"Uganda will surpass 400,000 tons of rice by 2015," Agriculture Minister Hope Mwesigye said. And, by 2018, production is expected to triple.

The government considers rice a priority crop and key to alleviating poverty. Minister Mwesigye noted that rice had helped reduce the country's absolute poverty from 50% to 23%.

In view of this, the government has established the Uganda National Rice Development Strategy. Under this national program, seven rice irrigation schemes are set to be constructed to increase local production.

"We want Uganda to be the regional food basket," Minister Mwesigye said during a ceremony where Japan donated US$7.8 million to Uganda to build a rice research and training center.

The center aims to develop the capacity of the rice industry and contribute to the dissemination of NERICA rice in Uganda and boost the income of eastern and southern African farmers.

Source: New Vision, www.newvision.co.ug

Genetic diversity of rice now secure in "Doomsday Vault"

The International Rice Research Institute (IRRI) has contributed an additional 42,627 samples of seeds from different types of rice to the Svalbard Global Seed Vault, dubbed the "Doomsday Vault," to help secure the world's rice diversity.

IRRI first deposited 70,180 rice samples during the inauguration of the Vault in February 2008.

"IRRI now has the largest number of samples of a single crop and its wild relatives, coming from the largest number of countries, stored in Svalbard," said Dr. Ruaraidh Sackville Hamilton, head of IRRI's International Rice Genebank (IRG).

The samples sent to Norway are duplicates of rice conserved at IRRI's IRG in Los Baños in the Philippines. The IRG currently houses the largest collection of rice genetic diversity in the world, containing around 110,000 different types of rice.

"IRRI shares seed from the IRG for free with farmers, farmers' groups, governments, and universities, among others, under conditions set by the International Treaty on Plant Genetic Resources for Food and Agriculture," Dr. Sackville Hamilton said. The Treaty ensures the fair sharing of benefits from the use of these resources.

Global race to find wild crop genes

The Global Crop Diversity Trust has launched a worldwide search for the wild relatives of 23 important food crops, including rice, to create a library of wild genes.

The work will take 10 years and the first collecting trips will start in 2011. The seed and plant samples will be conserved at a number of sites around the world, including the Svalbard Global Seed Vault in Norway. The government of Norway is giving US$50 million to fund the project.

CHRIS QUINTANA

THE INTERNATIONAL Rice Research Institute houses 110,000 different types of rice in its genebank.

"Miracle rice" finding proves we can never stop rice breeding

Environmental changes are to blame for a 15% drop in the yield of "miracle rice"—also known as IR8—since the 1960s when it was first released and lauded for its superior yields that helped avert famine across Asia at the time.

IR8 used to produce a maximum yield of 9.5 to 10.5 tons per hectare, significantly more than other varieties in the 1960s when average global rice yields were around only 2 tons per hectare. But, when grown today, IR8 can yield only around 8 tons per hectare, at most.

Dr. Shaobing Peng, a crop physiologist from the International Rice Research Institute (IRRI), and his team grew rice from original IR8 seeds preserved in the International Rice Genebank and compared them with IR8 seeds continuously grown and harvested over the last few decades.

"Our study eliminated changes in the genetic composition of IR8, which may have occurred over time, as the possible cause of the yield decline, and instead identified changes in the environment as the cause of the decline," Dr. Peng said.

"Hotter nights, which are known to reduce rice yields, and other environmental changes such as modifications in soil properties due to intensive rice cropping and air pollution are all possible contributing factors," he added.

According to Dr. Peng, the findings demonstrate the need for ongoing or "maintenance" breeding because it allows rice plants to cope with a changing environment.

Despite their limited progress in increasing rice yield potential, maintenance breeding efforts have had significant success in improving grain quality and maintaining rice yields despite substantial increases in diseases, insects, and environmental changes.

BRIEFLY

New pact to protect rice

The International Rice Research Institute (IRRI) and GrainPro, Inc. have signed a cooperation agreement to promote the adoption and dissemination of rice storage technologies in the Philippines to reduce postharvest losses that can be between 15% and 25% of rice harvests.

IRRI's postharvest expert, Engr. Martin Gummert, said the agreement helps provide farmers, processors, and seed producers with cost-effective technologies that help reduce postharvest losses and maintain the quality of rice and seeds.

Since 2002, IRRI and GrainPro have informally cooperated to develop and verify small-scale airtight storage systems such as the "Superbag."

Black rice bran reduces inflammation

A new study by the U.S. Department of Agriculture's Western Regional Research Center in Albany, California, has claimed that black rice may help soothe the inflammation involved in allergies, asthma, and other diseases.

Experiments involved giving black rice bran to laboratory mice and hinted that the bran suppressed the release of histamine, which causes inflammation.

Source: Times of India

Indian farmers adopt flood-tolerant rice at unprecedented rates

Field-testing a rice variety normally takes 4–5 years before it is released and another 2–3 years before it reaches farmers.

Through targeted dissemination, the International Rice Research Institute is helping Indian state governments identify specific flood-prone areas where seeds of submergence-tolerant rice can be distributed, without having to wait until it is multiplied and distributed en masse.

Source: www.irrinews.org

Appointments

Lloyd Le Page was recently appointed by the CGIAR Consortium Board as the first Consortium chief executive officer. Mr. Le Page, a British citizen, is currently leading the Sustainable Agriculture and Development Division of Pioneer Hi-Bred, a DuPont business. In this global role, he has primarily focused on working with small farmers and improving agricultural value chains in Africa and Asia.

He brings with him a great deal of practical experience globally, regionally, and locally. He has gained the trust and confidence of many stakeholders of the CGIAR community and has been consulted by some of the centers in the development of Consortium Research Programs. Mr. Le Page is expected to lead the CGIAR in the implementation of its new business model.

Glenn Gregorio was appointed as deputy head of the Plant Breeding, Genetics, and Biotechnology (PBGB) Division effective 1 October. Dr. Gregorio's primary responsibility in his new post is providing support to the head of PBGB in risk management and quality assurance activities, and in mentoring new staff. Dr. Gregorio will continue to be senior scientist and plant breeder for abiotic stresses such as salinity and zinc deficiency.

Awards and recognition

IRRI and its staff members were honored at the 3rd International Rice Congress (IRC2010) held on 8-12 November in Hanoi, Vietnam. The Vietnamese government conferred upon IRRI the First Class Friendship Order during IRRI's 50th anniversary to acknowledge the Institute's contributions to Vietnamese agriculture and almost half a century of collaboration between the two parties.

LANIE REYES

Nine IRRI scientists received the Merit Medal "for the cause of science and technology development of Vietnam." The recipients were (*from left in photo above*) **Robert Zeigler**, director general; **Achim Dobermann**, deputy director general for research; **Gurdev Khush**, former IRRI rice breeder and principal scientist (1967-2001); **To Phuc Tuong**, principal scientist; **Darshan Brar**, head of PBGB; **K.L. Heong**, senior scientist; **Abdelbagi Ismail**, senior plant physiologist; **Grant Singleton**, senior scientist; and **Roland Buresh**, principal scientist (*not in photo*).

The Merit Medal "for the cause of agriculture and rural development of Vietnam" was given to **William Padolina**, deputy director general for operations; **David Mackill**, principal scientist; **David Johnson** and **Martin Gummert**, senior scientists; **Sushil Pandey**, senior economist; and **Julian Lapitan**, head of National Programs Relations.

K.L. Heong, senior scientist and insect ecologist, was honored by the Third World Academy of Science, an international organization that promotes scientific excellence for sustainable development in the South. Dr. Heong has been cited for his significant contribution in pest management related to ecology, biodiversity, and education. He developed insect population models for understanding predator-prey and insect-plant relationships, and quantified food webs in rice ecosystems and the impact of pesticides on biodiversity. From his research to understand farmers' decision-making processes, he designed communication campaigns and entertainment-education programs for farmers. Dr. Heong is also one of the five newly elected fellows for agricultural sciences who will be inducted in the 22nd General Meeting of the CGIAR in Morocco in 2011.

Kyu-Seong Lee, director of the Korea Plant Industries Association Cambodia Center of the Rural Development Administration (RDA), Republic of Korea, received this year's Senadhira Rice Research Award in recognition of his outstanding contributions to rice research and international cooperation in rice varietal development. The award is given to a leading Asian scientist working on rice research. The award ceremony took place at the International Rice Congress in Vietnam.

Dr. Lee is a former IRRI scientist who conducted seminal research on the genetics of resistance to bacterial blight in rice and, under the Germplasm for Utilization for Value Added (GUVA) project, produced quality seeds of japonica rice varieties for Korean farmers. He developed a collaborative project between RDA and IRRI aimed at developing more nutritious rice varieties for Korea and other countries. He has tirelessly promoted international collaboration between Korean scientists and scientists from IRRI and other rice-growing countries.

TRAINING COURSES AT IRRI

SNP Data Analysis Training Course

IRRI Training Center, Los Baños, Philippines
7-11 March 2011

This course will provide IRRI researchers and scholars with the essential knowledge required to navigate new single nucleotide polymorphism (SNP) data sets. The goal is to introduce participants to the available tools to handle these types of data and apply them in their own research projects. The course will include hands-on sessions for participants to be familiar with the different software and online tools for SNP data analysis.

Rice: Research to Production

IRRI Training Center, Los Baños, Philippines
16 May to 3 June 2011

This course aims to create a new generation of plant scientists that are well networked in the international community and understand the importance of innovative plant science in tackling global problems. Topics include an understanding of the basics of rice production in Asia; familiarity with the germplasm collection at IRRI and current issues related to germplasm exchange and intellectual property; an appreciation of the research issues of IRRI and its developing-country partners; hands-on skills relating to rice breeding, molecular genetics, and genomics; an understanding of how to structure effective international collaboration; and a plan and personal contacts to work effectively as part of the international research community in the future.

Rice Breeding Course

IRRI Training Center, Los Baños, Philippines
8-23 August 2011

This course aims to develop the next generation of rice breeders adept in using modern tools to enhance the precision and efficiency of their breeding programs. It will provide the theoretical background on modern breeding methods and techniques, including the use of biotechnology; planning and information management tools and experimental techniques and software; the opportunity to share experiences with other rice breeders; and the latest updates on areas relevant to rice breeding and the worldwide exchange of rice genetic resources. Breeders and agronomists working on variety development or testing in the public and private sector are highly encouraged to attend.

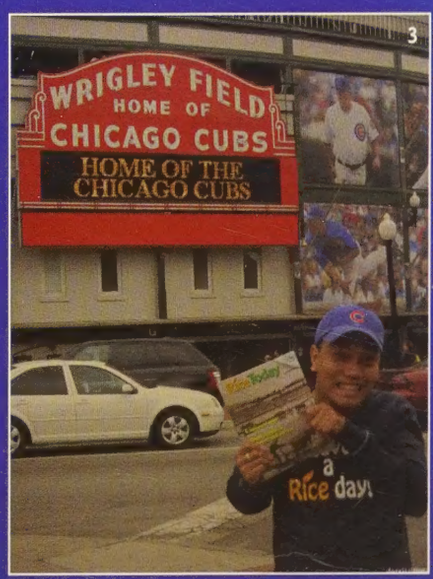
Molecular Breeding Course

IRRI Training Center, Los Baños, Philippines
3-14 October 2011

This course aims to provide hands-on training that would enhance rice scientists' capability to apply molecular technologies in ongoing rice breeding programs. These programs seek to develop high-yielding varieties that are resistant to various biotic and abiotic stresses, and that will produce rice with improved grain and nutritional quality.

For more details, contact Dr. Noel Magor, head, IRRI Training Center (IRRITraining@cgiar.org) or see **www.training.irri.org.**

RiceToday around the world



1. A MEMORABLE read. (*left to right*) IRRI Communication and Publications Services staff member Gigi Caballero, water scientist Dr. Ruben Lampayan, and research and extension specialist Rowie Baltazar celebrate Hanoi's (formerly known as Thang Long) 1,000th anniversary with *Rice Today* in Vietnam.
2. CATCHING UP on their reading. Participants at the International Rice Congress 2010 take time to read the magazine in between sessions.
3. HOME RUN. IRRI Web specialist Darell Sison greets the Windy City, home of the Chicago Cubs, with *Rice Today* in tow.
4. WARM WELCOME. Iranians greet IRRI Deputy Director General for Research Achim Dobermann (*fourth from left*) and IRRI scientists Arvind Kumar (*third from left*), Casiana Vera Cruz (*fifth from left*), Melissa Fitzgerald (*sixth from left*), and Jauhar Ali (*eighth from left*), and *Rice Today* with a big banner in front of the mosque in Rasht.

Books launched during the Third International Rice Congress

Rice in the Global Economy: Strategic Research and Policy Issues for Food Security

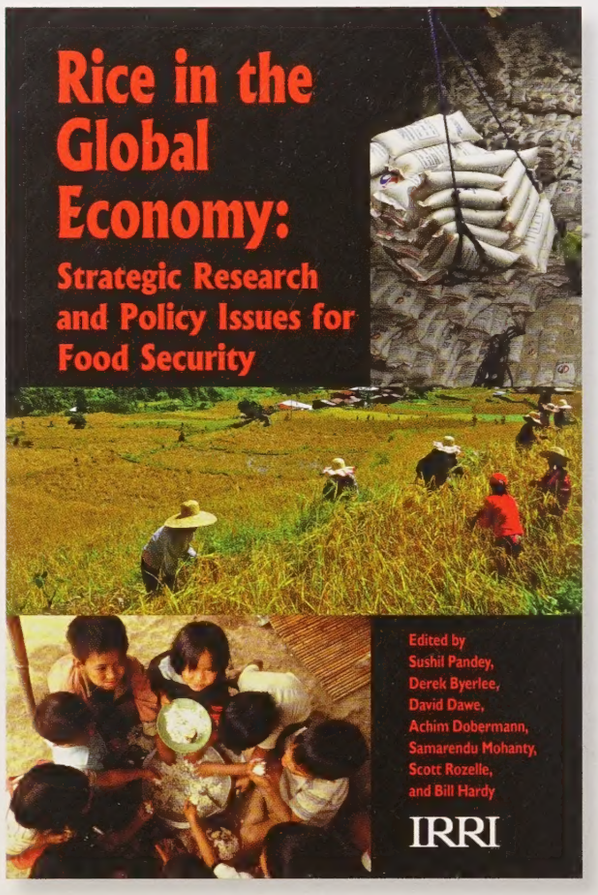
Edited by Sushil Pandey, Derek Byerlee, David Dawe, Achim Dobermann, Samarendu Mohanty, Scott Rozelle, and Bill Hardy

Worldwide, rice is the most important food for the poor. It is grown on approximately 155 million hectares and accounts for one-fifth of the global calorie supply. Although traditionally an Asian crop, rice has long been a staple in parts of Africa and Latin America, and its importance is growing in those regions.

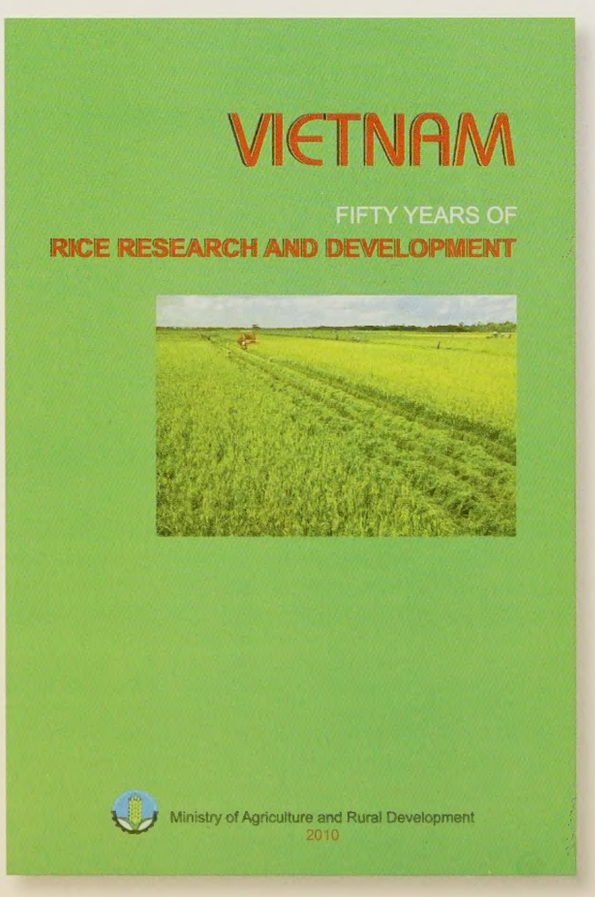
The past decades have seen many changes that shape how rice will be produced in the future. These include rapid economic growth, especially in parts of Asia, rising wage rates, increasing diversification of diets, global climate change, and a greater integration of the food economy with other sectors of the global economy, including both energy and financial markets. In the context of these major global trends, a new vision for future rice farming, which will strategically position investments in rice research, technology delivery, and the design of policy reforms, needs to be developed.

This forward-looking book presents a vision for the future of rice farming. And, it answers key strategic questions in the context of major developments in the global economy. Various scholarly contributions in this book examine these strategic questions and lay out a rich menu of options on how to improve rice systems sustainably and enhance the overall performance of the global rice economy in order to reduce poverty and hunger.

This book was officially launched during the Third International Rice Congress held last 8-12 November in Hanoi Vietnam. View videos of the launch at http://snipurl.com/1rlh9k. View and download on Google Book Search at http://snipurl.com/1ny959.



To order IRRI books online, please e-mail RiceworldBookstore@cgiar.org.



Vietnam: 50 Years of Rice Research and Production

Edited by Bui Ba Bong, Nguyen Van Bo, and Bui Chi Buu
Published by Agriculture Publishing House, Hanoi, Vietnam

Rice is a way of life for the Vietnamese. This staple crop is deeply rooted in the cultural heritage of the country. It not only contributes to national food security but also provides income and reduces poverty for the millions of people in the rural sector. The Doi Moi (renovation policy) in the mid-1980s marked Vietnam's transition from a country suffering from food shortage to one of the largest rice producers in the world. The policy is significant as it granted farmers the right to own land and opened Vietnam's economy to the free market. Investment in infrastructure and technology also helped further boost the country's rice production capacity.

Since Vietnam developed its rice research and production, the country has been facing challenges of decreasing natural resources, particularly rice land and water, global climate change, and increasing population. While looking back at the country's last 50 years of progress, the Ministry of Agriculture and Rural Development also gears to further improve and consolidate research, development, and agricultural policies to sustain long-term national food security, make the rice economy prosperous, and generate more income for rice farmers.

This book was officially launched during the Third International Rice Congress held last 8-12 November in Hanoi, Vietnam. View the launch at http://snipurl.com/1kdawo.

For information on obtaining a copy of this book, contact the Publishing Department, Ministry of Information and Communication of Vietnam, at http://snipurl.com/1kdb2k.

Research to Impact: Case Studies for Natural Resource Management for Irrigated Rice in Asia

Edited by Florencia G. Palis, Grant R. Singleton, Madonna C. Casimero, and Bill Hardy

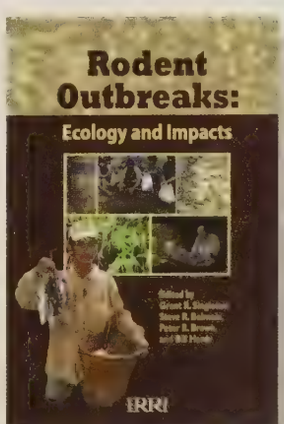
The 2008 global rice crisis stimulated Asian governments to allocate more investments to rice research and extension to increase the rice supply, help rice-importing countries achieve rice self-sufficiency, and allow exporting countries to produce surplus stocks. Considering this staple's political, economic, social, and cultural significance, a continued increase in rice productivity is critical in ensuring food security, reducing poverty and hunger, and enhancing environmental sustainability. Rice production, however, is challenged by declining water availability, the conversion of prime lands to alternate uses, the increasing problem of labor shortage, unpredictability of climate change, and widespread concern regarding the environment.

Thus, research and extension in agriculture continue to play important roles in agricultural development to improve the lives and livelihoods of Asian farmers and consumers. Research generates technologies and good agricultural practices or best practices for natural resource management (NRM) to boost resource-poor farmers' productivity and income. Extension provides mechanisms by which these NRM technologies can be disseminated for wide-scale adoption by farmers.

The impacts of NRM technologies can be realized only when the end users—rice farmers—practice them. Adopting agricultural technologies and best practices for NRM , however, remains a big challenge largely because most are knowledge-intensive technologies that cater to local adaptation by farmers, and not physical products. This book documents cross-country learning through case studies on the processes and methodologies employed from research to achieve impact by tackling the challenges of generating wider-scale adoption of NRM technologies in lowland irrigated agroecosystems. View and download on Google Book Search: http://snipurl.com/1nxxgy.

Rodent Outbreaks: Ecology and Impacts

Edited by Grant Singleton, Steve Belmain, Peter Brown, and Bill Hardy



The impacts of rodents in both developing and developed countries are legendary. Myths and dogma about rodents and their outbreaks abound—imbedded in the language and culture of many societies. In many instances, society's "acceptance" of these outbreaks becomes the greatest challenge of crop protection specialists or conservation biologists. The reason why these episodic outbreaks have become etched in the sociocultural psyche from the sparsely populated uplands of Laos to the considerably more affluent agricultural lands of Europe is that the impacts are often staggering—economically, socially, and even politically.

The advent of ecologically based rodent management has stimulated the progress summarized in this book. The contributions provide a modern appraisal to an age-old problem through bett understanding of the mechanisms that lead to rodent outbreaks, why rodent population numbers increase under different circumstanc and the impact of outbreaks in a range of different agroecosystem and native forests in different parts of the world. This is an encouraging progress report by scientists passionate about rodents, people, conservation, and improving knowledge concerning these species and the ecosystems they inhabit. And, in a novel twist, there is an appendix of recipes for preparing rat meat. One will be more than tempted to t one of these dishes the next time one travels in Asia or Africa. View and download on Google Book Search: http://snipurl.com/1nxyii

A Practical Field Guide to Weeds of Rice in Asia (Second Edition)

By B.P. Caton, M. Mortimer, J.E. Hill, and D.E. Johnson

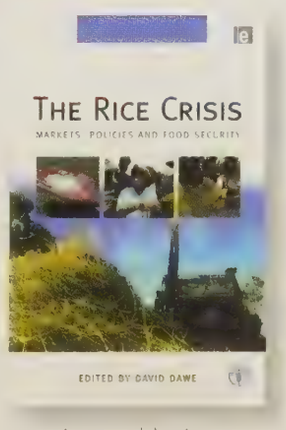
Weed infestations are every farmer's concern. Depending on the type of rice production system, farmers across Asia often contend with similar weed species. This group of species is relatively small, but of great importance, and includes many of the "world's worst weeds."

Aside from the practical information about some of the most common weeds of rice in Asia, this easy-to-use guide has information about the botany, ecology, herbicide resistance, and cultural control of these species. Its illustrations aid in early and accurate species identification.

This book aims to help farmers, extension agents, researchers, and others assess weed control problems and, when possible, provide strategies for improving integrated weed management in rice systems. Hopefully, it will assist farmers to better understand the relationships among land preparation, rice establishment methods, and early-season water management practices that often strongly influence the particular weed species that infest their rice fields. View and download on Google Book Search: http://snipurl.com/1ny8fr.

The Rice Crisis: Markets, Policies and Food Security

Edited By David Dawe
Published by the United Nations Food and Agriculture Organization



The recent escalation of world food prices—particularly for cereals—prompted mass public indignation and demonstrations in many countries. The crisis left important implications for future government trade and food security policies, as countries re-evaluate their reliance on potentially more volatile world markets to augment domestic supplies of staple foods.

This book examines how government policies caused the crisis and responded to the soaring world prices, particularly that of rice, the world's most important source of calories for the poor. Comparative case studies of policy reactions in different countries, principally across Asia, and including the U.S., provide the necessary understanding to be able to evaluate the impact of trade policy on the food security of poor farmers and consumers. These studies also provide important insights into the concerns of developing countries that are relevant for future international trade negotiations on key agricultural commodities. As a result, more appropriate policies can be put in place to ensure more stable food supplies in the future.

Rice for future generations

by **Mia Aureus** and **Lanie Reyes**
photos by **Lanie Reyes** and **Gene Hettel**

IRRI holds its Third International Rice Congress in Hanoi—strengthening its commitment to ensure food security for tomorrow's generation

The International Rice Research Institute (IRRI), in partnership with AsiaCongress, held its Third International Rice Congress (IRC2010) on 8-12 November at the National Convention Center in Hanoi, Vietnam. Attended by more than 1,900 participants from more than 66 countries, the event could not have come at a more opportune time as the world once again faces a fork in the road to ensuring global food security.

During the opening of the IRC2010, Dr. Robert Zeigler, IRRI director general, noted that rice remains of utmost importance to the developing world, especially in Asia, but increasingly in Latin America and Africa, where rice is the fastest growing food staple.

"Projected demand for rice will outstrip supply in the near to medium term unless something is done to reverse the current trends of slow productivity growth and inefficient, often unsustainable management of natural resources," Dr. Zeigler stressed.

"By 2050, it is our responsibility to increase global food production by 70% and to double food production in developing countries," Vietnam's Minister of Agriculture and Rural Development Cao Duc Phat said. "This is essential to feed the world's fast-growing population."

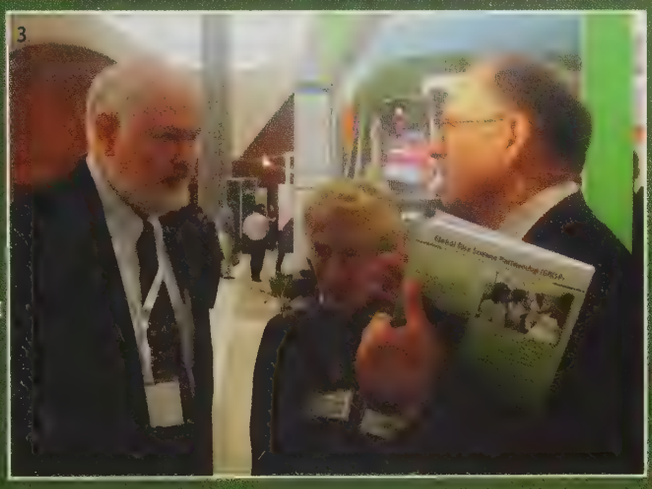
Vietnam's Prime Minister Nguyen Tan Dung, however, pointed out that efforts to increase food security are currently threatened by industrialization and urbanization that have shrunk the area planted with rice, climate change, plant diseases, poor investments in agriculture, inefficient policies, and the use of crops for biofuels, among other challenges.

For International Fund for Agricultural Development President Kanayo Nwanze, the world is now standing at a crossroad. One road leads to a path of least resistance, through which people do nothing and risk creating a world replete with poverty, hunger, and social instability. The other leads to a path of action, through which people dare to act now and invest in agricultural and rural research and development to create a brighter future in which people can grow healthy and have better opportunities and choices in life.

Aptly themed "Rice for future generations," the IRC2010 signified a definitive step toward the path of action. Both the public and private sector have rallied their support in pushing for better investments in agriculture. Through Vietnam's Ministry of Agriculture and Rural Development, the Vietnamese government played a significant role as host for the event—highlighting Vietnam's success story in pulling the country from a state of poverty after the Vietnam War in the 1950s to 1970s to a flourishing nation that now holds the title of the world's second-largest rice exporter. Private companies, namely, Bayer, Syngenta, Kubota, Pioneer, and Lindsay Corporation, particularly served as partners of the event.

STREET SIGNS in Hanoi herald the IRC.

1. DR. SANDY Barker, an expert on contested waterscapes in the Greater Mekong Basin from Cornell University (*left*) engages in a fluid conversation with Chu Thai Hoanh of the International Water Management Institute.
2. COFFEE BREAK is a chance for scientists to mingle with each other just like Bruce Linquist (*left*), UC-Davis plant scientist, and Dr. David Johnson, IRRI weed scientist.



3. NORMAN UPHOFF of Cornell University (*left*) and James Hill (*right*), former IRRI agronomist and currently associate dean, International Programs, at UC-Davis, debate the System of Rice Intensification (SRI).
4. CGIAR Consortium Board Chair Carlos Pérez del Castillo (*left*) visits with IRRI Board of Trustees member Tony Fischer. Mr. Pérez del Castillo helped launch GRiSP during IRRI's gala 50th birthday celebration and dinner.

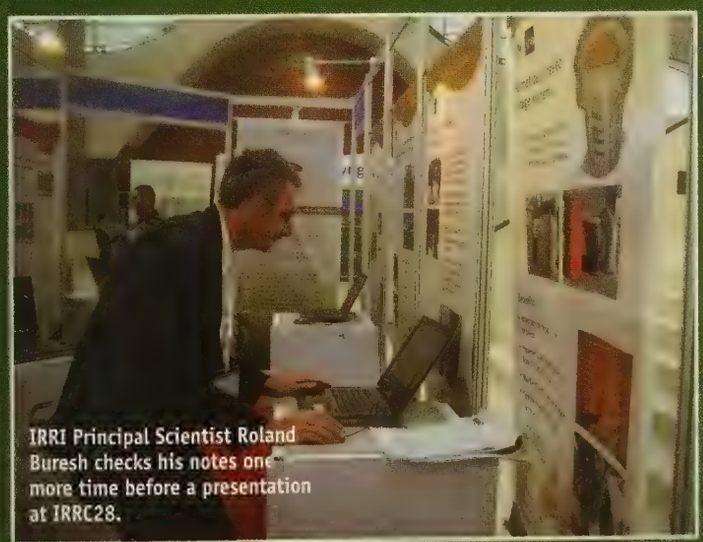
Dr. Zeigler said that it is the IRC2010's hope to bring everyone together to advance rice science and its application to reduce poverty and hunger, improve human health and nutrition, and create a better environment.

The 28th International Rice Research Conference (IRRC28)—which was considered the heart of IRC2010—gathered the world's top rice scientists to discuss the latest scientific breakthroughs in rice that aim to provide solutions to problems posed by climate change, plant diseases, industrialization and urbanization, etc., and ultimately increase yields to meet global demand.

Moreover, in conjunction with IRRC28, the first International Rice Policy and Investment Conference brought members of the rice market together to discuss key issues concerning rice trade and the impact of policy and investment on the rice business infrastructure (see *The rise of rice* on pages 16).

All participants were also invited to the Third International Rice Technology and Cultural Expo that featured the latest technologies, equipment, and machinery for rice farming, processing, research, and development.

Recognizing Asia's crucial role in supplying rice to the world—as it



IRRI Principal Scientist Roland Buresh checks his notes one more time before a presentation at IRRC28.

IRRI's IRC exhibit was popular with visitors.

produces more than 90% of global rice—Asian ministers and their representatives gathered on 9 November to discuss the recent report titled *Never an empty bowl: sustaining food security in Asia* (see *Asian pushes for sustainable food security* on page 17).

Finally, IRC2010 also provided the perfect avenue to officially launch the Global Rice Science Partnership (GRiSP), along with the book *Rice in the Global Economy: Strategic Research and Policy Issues for Food Security* (see book section on pages 10-11).

GRiSP is a mega-program that embodies the global effort to improve rice yields sustainably, lower food prices, and lift millions of people from poverty (see *Blueprint for a greener revolution* on pages 18-21). The launch of this program marks the beginning of a 5-year, nearly US$600 million endeavor. While GRiSP builds on existing research, development, and funding, it requires additional new financial support to raise annual funding for rice research from around $100 million in 2011 to $139 million in 2015 to fully realize its potential.

"With many difficulties and challenges still facing food security, achieving this goal will require the effort of every nation, and especially the active support from developed countries and international organizations," Prime Minister Nguyen Tan Dung said. "We need coordinated action at regional levels as well as on a global scale."

Dr. Eija Pehu, World Bank (WB) adviser for agriculture and rural development, referred to WB President Robert Zoellick's "inclusive globalization" to emphasize the need for nations and people around the world to be more interactive, interconnected, and open in meeting these challenges. For

PROFESSOR AND academician Dao The Tuan, well-known agriculturalist in Vietnam and known as the "father" of many highly productive rice varieties (http://snipurl.com/1nxs5q), checks out the poster on Vietnam at IRRI's IRC exhibit.

A MAN demonstrates how to make *tò he*, an edible Vietnamese toy fashioned from colored rice dough, during the welcome reception for IRC delegates.

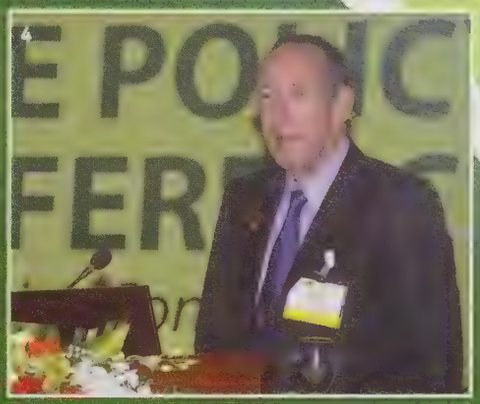
SIGRID HEUER, IRRI molecular biologist, discusses her work with visitors during one of the IRC scientific poster sessions.

Dr. Pehu, three key tasks lie ahead: (1) keep the message of agriculture's positive contribution to poverty reduction, economic growth, and environmental sustainability—including agriculture's critical role in combating climate change—high on the agenda; (2) support existing research partnerships and build new ones in a multipolar world; and (3) champion innovation that builds on differences as a foundation of strength.

Moreover, along with IFAD President Nwanze, Dr. Pehu stressed the need to recognize women's and youth's role in breaking the vicious cycle of poverty and ensuring food security. She said that WB aims to have 75% of agriculture and rural development projects benefit women by 2014. Also, she advised that everyone must be mindful of "how we develop and encourage the potential of our youth."

IFAD President Nwanze echoed. "If we do not engage the world's rural youth today—and lay the groundwork for profitable rural enterprises tomorrow—they will be driven to cities in search of other opportunities. If we allow this to happen, we will be left with no one to plow the fields that will feed the future."

Yes, the future belongs to the young farmers of today. And, it is only apt that the IRC2010 also signifies a renewed commitment to young people, to later pass on to them the torch of knowledge in rice science development that will sustain rice production for future generations.



1. IFAD PRESIDENT Kanayo Nwanze explains the importance of investing in agricultural and rural research and development.
2. DR. EIJA Pehu, World Bank adviser for agriculture and rural development, reminds the delegates of women's and youth's role in ensuring food security.
3. "THERE IS no better example than Vietnam of how a vibrant rice sector can serve as the engine of growth for an agrarian society," says Dr. Robert Zeigler, IRRI director general.
4. MR. SAM Dryden, director of the agricultural development program at the Bill & Melinda Gates Foundation, explains why rice will never be just another commodity at the International Rice Policy and Investment Conference—a new feature in the IRC2010 program that highlights the importance of sound policy and wise investment for future global food security.
5. VIETNAM PRIME Minister Nguyen Tan Dung acknowledges IRRI's many scientific achievements and its assistance to and support for his country's rice production over the past decades.
6. (*From left to right*) In front row, Dr. Hei Leung, Dr. R.K. Singh, and Dr. Edilberto Redoña; at the back, Dr. Ken McNally and Dr. Glenn Gregorio, IRRI scientists, and Dr. S.K. Dubey, a scientist at the Indian Agricultural Research Institute, convene between sessions to brainstorm on an innovative way of breeding for the rice plant of the future.
7. DR. GURDEV Khush (*left*), former IRRI principal scientist and 1996 World Food Prize laureate, shares his thoughts with some participants.

IRC2010 videos

3rd INTERNATIONAL RICE CONGRESS 2010 Hanoi, Vietnam

http://irri.org/IRC_videos

A set of 45 videos, shot by Gene Hettel, includes highlights from the opening ceremonies, two book launchings, and selected sessions of the first-ever International Rice Policy and Investment Conference (IRPIC) and the 28th International Rice Research Conference (IRRC28), both held as part of the Congress. The launching of the Global Rice Science Partnership (GRiSP) is also featured.

The rise of RICE

by **Mia Aureus**

Rice finds its way back to the top of the agenda as nations across the world try to attain food security in the face of an unpredictable climate and a volatile rice market

LANIE REYES

Rice will never be just another commodity.

Much of the truth behind this simple statement can be derived from the 2008 rice crisis that shocked the world and triggered massive protests in Africa and parts of Asia. It revealed the fragile economic state of many families across the world that relied on this staple for daily nourishment. Rice, which has dwindled in significance after the successes of the Green Revolution, was suddenly catapulted again to a national priority and an international imperative—with several new challenges that will test the ability of the world to deliver food for the future.

Speakers at the first-ever International Rice Policy and Investment Conference (IRPIC) covered key issues on rice trade and the impact of policy and investment. This conference, organized in conjunction with the 28th International Rice Research Conference during the International Rice Congress 2010 held in Hanoi, Vietnam, 8-12 November, highlighted rice's importance in both achieving food security and reducing poverty.

Considering that half of the world depends on rice, any tip in the balance of global rice production can cause ripple effects in the market that eventually hit poor farmers and consumers. Dr. Samarendu Mohanty, head of the International Rice Research Institute's (IRRI) Social Sciences Division and IRPIC organizer (*photo above*), pointed out that, over the past 2 years, many nations have moved toward food security by attaining rice self-sufficiency. Nations have awakened to the truth that the agricultural sector demands as much attention as any other sector in the economic development process; hence, efforts to expand domestic production by increasing yield and providing better input subsidies have mushroomed in most countries.

Nations also saw a need to build their domestic stocks by increasing minimum support prices to encourage more farmers to plant, and, in some cases, governments such as India were compelled to protect their stocks by imposing an export ban. Trade restrictions, however, were often seen to distort the market and are therefore not healthy in the long run. Such market shocks, including calamities that drastically cut supplies, have brought a renewed focus on regional rice reserves to serve as a buffer. Plus, the challenge of a limited water and energy supply added two more constraints to production; these resources were previously assumed to be broadly available during the last Green Revolution. This has, in turn, made sustainability a recurring theme, as rice production's impact on the environment was also considered in assessing policy and investment initiatives.

Increasing yield is the key

According to IRRI, the key to building the global rice supply lies in improving yield. In his outlook for 2020 and 2035, Dr. Mohanty noted that, in order for the supply to keep up with the growing demand, the world needs to produce an additional 84 million tons of paddy in the next 10 years. This requires a 1.5% increase in yield every year compared with the current 0.8%. Dr. Mohanty added that, by 2035, without yield improvements, land available to rice must expand by much more so as to produce the additional 116 million tons that will be needed to keep the world sufficiently fed. But, little land is now available for expansion.

IRRI's main thrust is to use innovative technology to develop new varieties that can provide better yield and thrive during drought, flooding, and salinity, among other extreme conditions.

Marker-assisted breeding and hybridization are two modern technologies that have been used to develop new rice varieties that have been adopted in major rice-growing countries. Genetically modified (GM) rice may also hold potential to safely deliver unique rice varieties that cannot be achieved through other breeding methods—although currently, no GM rice is commercially available.

Moreover, Dr. Thomas Reardon of Michigan State University pointed out that increasing yield does not necessarily lie only in developing new varieties (http://youtu.be/EXJygMGlSL4). Sometimes, it just simply needs efficient postharvest and structural management. Poor postharvest practices can reduce yield by 15–20%. He also noted that moving away from long supply chains can help prevent a large amount of rice from being wasted. Citing China as an example, he said that 5% of production is lost in just bringing rice from the farm to the plate.

Strength in policy and investment

To be able to obtain the necessary technologies, the rice sector calls for better policies and more investments. The Bill & Melinda Gates Foundation has recognized the strength that lies behind these two factors, and it has already put its financial support behind IRRI's initiatives—most recently, the Global Rice Science Partnership (see *Blueprint for a greener revolution* on pages 18-21). Prahbu Pingali, deputy director of agricultural development at the Foundation, said that the Foundation believes that everyone should have a healthy, productive life, and IRRI's innovative research is recognized as a vital tool that will catalyze a shift toward this vision. While investments start to come in, governments are further encouraged to do their fair share to implement more efficient policies that will sustain the development of these programs for the benefit of the present and future generations.

See selected IRPIC video clips on YouTube at http://irri.org/IRPIC_videos.

Asia pushes for sustainable food security

Never an empty bowl video on YouTube: http://youtu.be/HvCBQD3An9g

by **Robert Hsu**

Asian leaders gather to chart the next steps toward ensuring enough rice in every bowl

The Asia Society and the International Rice Research Institute (IRRI) task force report, *Never an Empty Bowl: Sustaining Food Security in Asia*, was the focus of the Ministerial Roundtable Meeting on rice at the Third International Rice Congress (IRC2010) in Hanoi, Vietnam, on 9 November.

The Ministerial Roundtable Meeting was chaired by Vietnam's Minister of Agriculture and Rural Development Cao Duc Phat and IRRI Director General Robert Zeigler. Representing the Asia Society at the meeting was Dr. Peter Timmer, the task force's principal advisor. Officials from 19 countries (Australia, Bangladesh, Cambodia, China, Egypt, France, India, Indonesia, Iran, Iraq, Italy, Laos, Malaysia, Myanmar, Nigeria, Saudi Arabia, Sri Lanka, Thailand, and Vietnam; written statements provided by Brunei Darussalam and Singapore) and seven international and aid organizations, including the World Bank, the International Fund for Agricultural Development, the UN Development Programme, and the Asian Development Bank, participated in the meeting.

Participants shared their insights into how the task force report fits into their own specific national and institutional food security plans and expressed unanimous support for the report's findings and recommendations. All participants agreed that implementing the four major recommendations contained in the report is critical to achieving food security in the long term and improving access to affordable rice in Asia and throughout the world. The report specifically recommended raising and sustaining the productivity of rice farmers in ways that conserve water, land, and energy-intensive inputs, while also building resilience to the expected impacts of climate change; improving the environment for rural development, including farm and nonfarm activities locally, nationally, and regionally, with renewed attention to how to stabilize domestic food economies; providing safety nets and more nutritious foods to the rural and urban poor so that they can lead productive lives even in the face of significant risks and vulnerabilities; and providing regional public goods for sustainable food security in Asia.

One common theme that emerged from the meeting was how Asia's growing population and economic development will impact the availability of rice for future generations. Participants widely agreed on the need for greater investments into strengthening the global rice economy, particularly in Asia, to reduce supply vulnerability and prevent the emergence of another food crisis like the one that occurred in 2008.

"There was great enthusiasm for the messages contained in the report and for the clarity in which they were presented," said Dr. Timmer after the Ministerial Roundtable Meeting. "The next step is for participating officials to take the report back to their countries (and institutions) and use it as a framework to help analyze and formulate their own food security policies."

Mr. Hsu is a senior program officer for policy studies at the Asia Society.

Ministry of Agriculture and Rural Development, Vietnam
International Rice Research Institute
IRRI
50
3rd INTERNATIONAL RICE CONGRESS 2010
The 3rd Ministerial Roundtable Meeting on Rice

Blueprint for a gre

GRiSP is an innovative and holistic work plan that seeks to improve international partnerships in rice research, its delivery, and impact

"One finger cannot lift a pebble," says an African proverb.

The significance of working together cannot be overemphasized—especially now, when the road to attaining food security and poverty alleviation is riddled with challenges such as decreasing agricultural lands, depleting natural resources, looming climate change, diseases, and poor investment in agriculture. It is for this reason that the International Rice Research Institute (IRRI), the Africa Rice Center (AfricaRice), the International Center for Tropical Agriculture (CIAT), and many other organizations have come together to design an innovative solution anchored on partnerships. Aptly named the Global Rice Science Partnership (GRiSP), this "mega" program aims to help billions of people around the world who largely depend on rice as their daily source of nourishment.

A global blueprint

GRiSP represents—for the first time ever—a single strategic blueprint for global rice research and how it can contribute more effectively to solving development challenges at the local, national, and regional levels. It is a Consultative Group on International Agricultural Research (CGIAR) Research Program (CRP) under the theme "sustainable crop productivity for global food security." It streamlines current research for development of the CGIAR.

"The development of GRiSP has given a great impulse to the reform agenda of the CGIAR," said Dr. Carlos Pérez del Castillo, chair of the CGIAR Board, during the Third International Rice Congress (IRC2010) held in Hanoi, Vietnam, last 8-12 November, where GRiSP was formally launched. "International agricultural research has continuously played a key role in helping increase the world's food production."

As the first CRP to be approved, GRiSP illustrates rice's importance as a staple food for the world's growing population. For every 1 billion people added to the world's population, 100 million tons of rice (paddy) need to be produced each year—with less land, less water, and less labor, in more eco-efficient production systems that are more resilient to climate change and that also contribute less to greenhouse gas emissions.

Experts project that demand for rice will continue to increase and will exceed supply in the near future. They say that an additional 8 million tons of rough rice need to be produced each year for the next 10 years. Unfortunately, the area planted to rice can no longer expand beyond the currently used 155 to 160 million hectares. The challenge is to reverse the current trends of slow productivity growth and inefficient, often unsustainable management of natural resources. The 2008 rice crisis is a grim reminder that steep and long-term price increases could wreak havoc on the lives of people and send dangerous tremors across the political and economic landscapes in the world's most populous regions.

PANELISTS DURING discussion on GRiSP: (1) Alain Ghesquière, head of IRD Genome and Development Research Unit; (2) Achim Dobermann, IRRI deputy director general for research; (3) Marco Wopereis, AfricaRice deputy director general and director of research for development; (4) Carlos Pérez del Castillo, chair of CGIAR Consortium board; (5) César Martinez, CIAT rice program leader; and (6) Robert Habib, head of CIRAD Department of Tropical Production and Processing Systems.

LANIE REYES (6)

ner revolution

by **Achim Dobermann**

CHRIS QUINTANA

SALINITY-TOLERANT lines developed by Dr. Glenn Gregorio, IRRI plant breeder, and his team are designed to help farmers who are affected by salinity, particularly in areas susceptible to sea-level rise.

How rice is currently grown must be changed. Traditional rice systems have high environmental footprints that range from water to carbon footprints. Thus, rice needs to be produced with less tillage, less labor, less pesticide, with generally more efficient use of inputs such as nutrients and water, and with increased resilience to cope with climate change. Across the world, rice will have to tolerate extreme temperatures and survive droughts, floods, and salinity. The delta regions, from which much recent gain in production comes, will be particularly susceptible to rises in sea levels and stronger tropical storms.

In harmony with the CGIAR

The mission of GRiSP is synchronized with that of the CGIAR, that is, *to reduce poverty and hunger, improve human health and nutrition, reduce the environmental footprint, and enhance ecosystem resilience of rice production systems through high-quality international rice research, partnership, and leadership.*

In harmony with the CGIAR's objectives, GRiSP laid out three specific aims: (1) to increase rice productivity and value for the poor in the context of a changing climate through accelerated demand-driven development of improved varieties and other technologies along the value chain; (2) to foster more sustainable rice-based production systems that use natural resources more efficiently, are adapted to climate change and are ecologically resilient, and have reduced environmental externalities; and (3) to improve the efficiency and equity of the rice sector through better and more accessible information, improved agricultural development and research policies, and strengthened delivery mechanisms.

Breaking the poverty cycle

To achieve its goals, GRiSP plans to foster high-quality, impact-oriented research and development activities in a global context. Strategically, the key point for farmers to enter into a virtuous circle is to raise the productivity and resource efficiency of rice production systems to unprecedented levels (see Fig. 1). Better income will enable farmers to invest more in diversification and sustainable management practices—improving their food security, nutrition, health, and the environment.

All about rice

The overarching organizing principle of the partnership is rice-based production systems and value chains (the "from field to market principle"). All research will use an interdisciplinary approach in which targeting and prioritizing are based on a clear understanding of the different targeted environments, management systems, and market segments. On the one hand, this will need a broad range of scientific, or upstream, partners to seek out innovations and, on the other hand, many partnerships at the grass-roots level for both dissemination and feedback. The result will be accelerated development of international public goods across the whole rice sector. Based on these considerations and for effective management of the research and development process, the program components are structured into six major rice research and development themes: (1) harnessing genetic diversity to chart new productivity, quality, and health horizons; (2) accelerating the development, delivery, and adoption of improved rice varieties; (3) ecological and sustainable management of rice-based production systems; (4) extracting more value from rice harvests through improved quality, processing, market systems, and new products; (5) technology evaluations, targeting, and policy options for enhanced impact; and (6) supporting the growth of the global rice sector.

A business-like approach

GRiSP will be viewed through a business perspective in terms of the structure and implementation of its research agenda. For example, the socioeconomic and biophysical factors that drive farmers, agribusinesses, small entrepreneurs, consumers, and many other actors in the value chain will be thoroughly understood through research. This will provide innovative tools and information needed for evidence-based targeting in GRiSP research and development themes

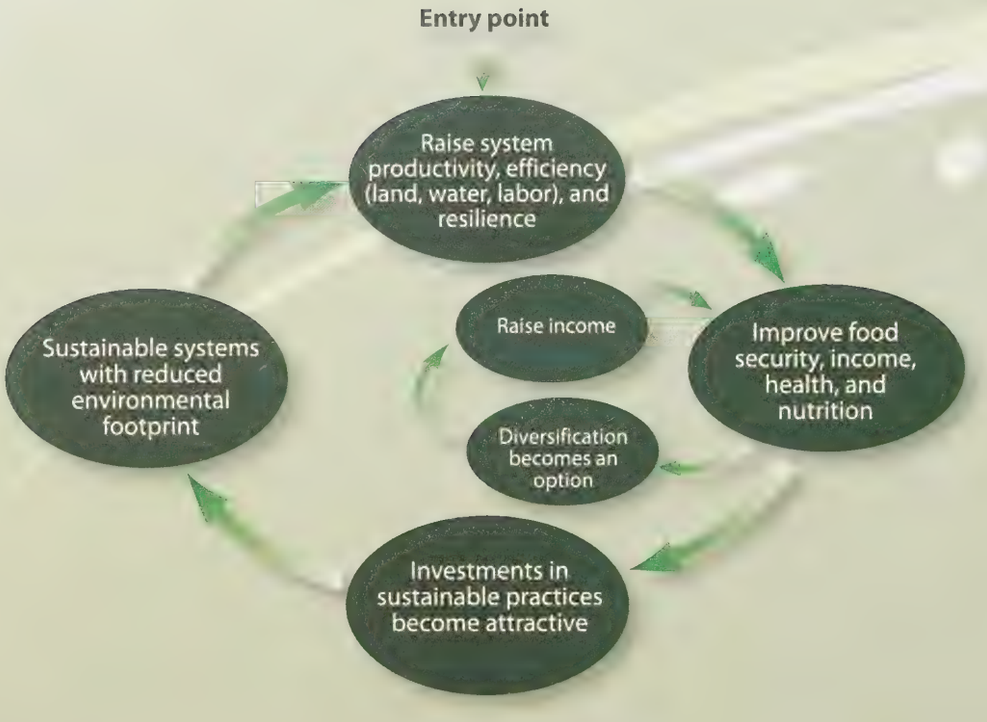

Entry point
Raise system productivity, efficiency (land, water, labor), and resilience
Raise income
Improve food security, income, health, and nutrition
Diversification becomes an option
Investments in sustainable practices become attractive
Sustainable systems with reduced environmental footprint

Fig. 1. Enabling farmers to enter a virtuous circle is the core goal of GRiSP.

that focus on the development of new products, their adaptation, and adoption. Plus, some feedback on adoption patterns, constraints, and true impact can be usefully gleaned through this.

"GRiSP will allow us to be more effective and efficient in creating impacts even with huge challenges," said Marco Wopereis, AfricaRice deputy director general. "But, we can guarantee faster results only if we know what we are doing, where and when, and with whom."

It is also worthy to mention that gender is inherent in GRiSP's objectives, and themes. And, capacity building in both rice science and extension is fully integrated to ensure adequate skilled personnel for future rice development.

An evolving alliance

"Through GRiSP, CIAT will be reconnected with the rice community in Asia and Africa," said César Martínez, CIAT rice program leader, giving his perspective on GRiSP during the IRC2010.

He explained CIAT's initial connection with Asia that dates back to 1967. At that time, Dr. Peter Jennings, an IRRI plant breeder, shared with them IRRI varieties, which, according to him marked the Green Revolution in Latin America. But, with this reconnection through GRiSP, he mentioned some benefits such as sharing rice technologies and germplasm, and improving capacity building for Latin America.

As an evolving partnership, GRiSP will be led by IRRI, which also oversees the activities in Asia. It is supported by AfricaRice, which leads the work in Africa, and CIAT in the Latin America & Caribbean region. Other internationally-operating research organizations such as the French Agricultural Research Centre for International Development (CIRAD), French Research Institute for Development (IRD), and Japan International Research Center for Agricultural Sciences (JIRCAS) will play a strategic role in GRiSP.

Since partnerships are the main drivers for reaching its vision, GRiSP serves as the umbrella to strengthen and expand partnerships. At present, the six international centers and organizations in GRiSP (IRRI, AfricaRice, CIAT, JIRCAS, CIRAD, and IRD) have about 900 research and development partners worldwide.

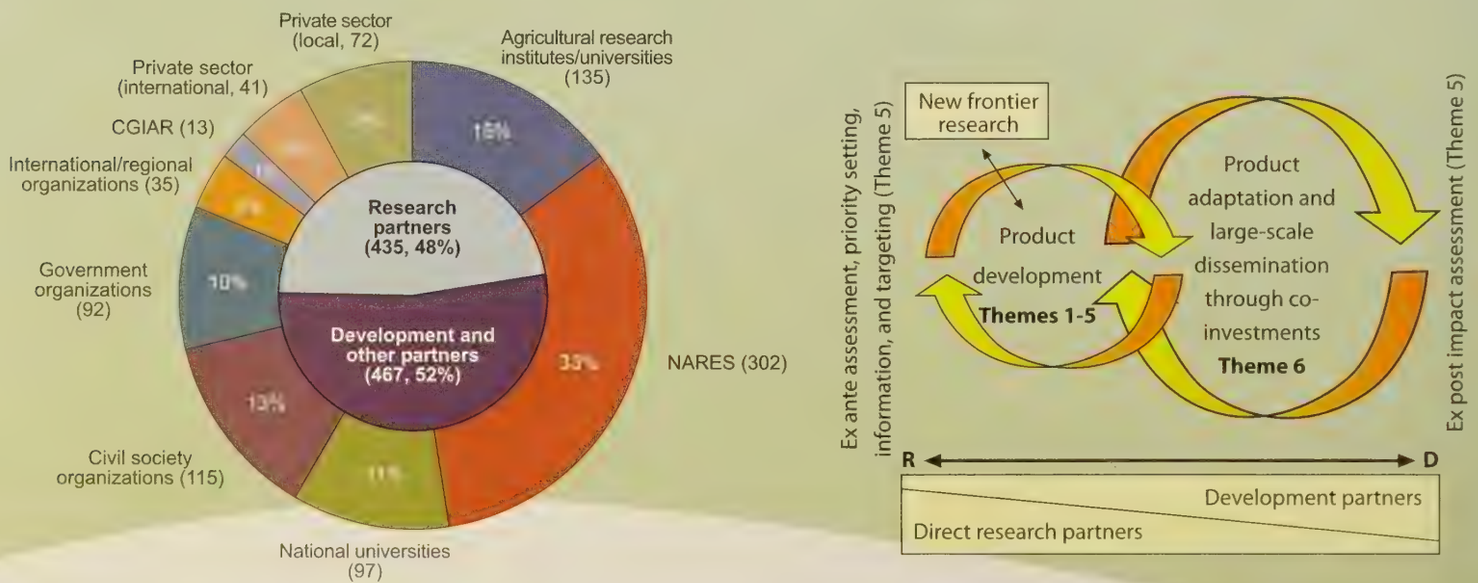


Fig. 2. Current partners and their roles in GRiSP.

JOSEPH BIGIRIMANA

RICE FARMERS will benefit from GRiSP through sharing of germplasm, technologies, and institutional capacity among hundreds of partner institutions.

Aside from strengthening existing partnerships, GRiSP also provides new opportunities for partnerships in research and development, bringing together its key players and stakeholders such as advanced research institutes and universities; national research, education, and extension systems; CGIAR centers; the private sector; and civil society organizations, among others (see Fig. 2). National rice research and development systems such as those of China, India, Japan, and Brazil will also significantly contribute to GRiSP by connecting their national research programs with GRiSP's global themes. GRiSP will expand its partnerships with civil society organizations such as nongovernment organizations and farmers' associations, among other groups. Partnership with the private sector is also an integral part of GRiSP.

Furthermore, GRiSP will be linked in various ways with other CRPs. Through its own activities and through collaborative projects, co-investment from or in other CGIAR Research Programs, and active participation by IRRI, AfricaRice, and CIAT and their partners in other CGIAR Research Programs, GRiSP will be fully integrated in the Strategy and Results Framework of the CGIAR Consortium. Several other CGIAR centers such as the International Maize and Wheat Improvement Center (CIMMYT), International Food Policy Research Institute (IFPRI), International Livestock Research Institute (ILRI), International Water Management Institute (IWMI)—to name just a few—will be involved in GRiSP-related projects and activities, including regional and national initiatives that cut across different CRPs and systemwide programs such as the Generation Challenge Program.

Vision of success

GRiSP has a clear view of what it wants to see in the future. It laid out concrete and quantifiable key impacts to benefit the poor, the hungry, and the environment in the next 25 years.

By 2035, those living under the US$1.25 (PPP) poverty line will reduce their expenditures by $11 billion annually (holding consumption constant). Spending less while gaining more income would mean that 150 million people would be lifted above the $1.25 poverty line, reducing global poverty by 11%.

As rice becomes more available and its price goes down, 62 million undernourished people would be able to consume sufficient calories per day in Asia—thus reducing the number of hungry Asians by 12%.

For the environment, nearly 1 billion tons of carbon dioxide equivalent emissions will stay clear of Earth's atmosphere.

Over a global 25-year inflation-adjusted investment of roughly $3 billion, or for every $20 of investment, one person is lifted above poverty—an efficient development investment that has a high return in poverty eradication.

For the past 50 years, countries such as Thailand and Vietnam, among others, have been transformed into leaders in the rice industry—a metamorphosis that could not have occurred without a revolution in rice cultivation. Now, with GRiSP's concretely laid-out vision of success, innovative and holistic approach, and the concerted efforts of hundreds of institutions that share a similar vision, the future will continue to make a difference in the lives of the poor around the world.

Dr. Robert Zeigler, IRRI director general, hopes that, "Through GRiSP, we can advance rice science and its application to reduce poverty and hunger, improve human health and nutrition, and create a better environment."

Notes: The full GRiSP document can be downloaded through http://irri.org/our-science/global-rice-science-partnership-grisp. See http://snipurl.com/1orsvy for selected YouTube video clips of the GRiSP discussion at IRC2010.

Dr. Dobermann is the deputy director general for research at IRRI.

COUNTRY HIGHLIGHT:

IRRI IN INDIA

Compiled by **Paula Bianca Ferrer**

NEL GARCIA, ARNEL RALA, AND MURALI KRISHNA GUMMA

India: fast facts (2009)

Population:	1.2 billion
Total land area:	2.9 million sq km[1]
Average rice yield:	3.0 tons per hectare
Total rice production:	131.3 million tons[2]
Area planted to rice:	44.1 million hectares[2]

[1]CIA World Factbook
[2]FAOSTAT

During the 1943 Bengal famine, 3 to 4 million people died because of widespread starvation. Since then, food security has been an important concern for India. For many years, the country had to sustain itself largely through imports. Moreover, it faced another dilemma when the population grew further. The introduction of newly developed semidwarf rice varieties in the 1960s helped India overcome such challenges to its food security, allowing the country to achieve rice-sufficiency and even become one of the major rice-producing countries today.

The semidwarf modern varieties enabled India to substantially increase its rice production without considerably increasing the area for this production. Many recent modern rice varieties can be traced back to the original semidwarf rice variety IR8, also known as "miracle rice," which was developed by the International Rice Research Institute (IRRI) and released in India in the 1960s. A miracle indeed: the country's rice production jumped from 31 million tons in 1950 to 111 million tons by 1990. By 2009, India produced 131 million tons of rice.[1]

India-IRRI partnership

IRRI began its partnership with India through the Indian Council for Agricultural Research (ICAR) in 1967. Indian scientists from the two main rice research centers of ICAR—the Central Rice Research Institute (CRRI) in Cuttack and the Directorate of Rice Research (DRR) in Hyderabad—regularly visited IRRI. In 1974, directors general M.S. Swaminathan and Nyle C. Brady of ICAR and IRRI, respectively, signed the first memorandum of understanding for cooperation in research and training. This paved the way for the two institutions to sign work plans every 4 years, reviewing the progress of research and identifying opportunities and areas in which both could collaborate. The synergy in their partnership resulted in advancements in the development of disease- and insect-resistant varieties suited to various rice environments, the development and release of public- and private-bred hybrid rice varieties, streamlining of rice production practices for improved sustainability and productivity, and increased training and information exchange with Indian researchers. ICAR and IRRI have been working together since 2009 on 37 major initiatives that include projects such as Stress-Tolerant Rice for Poor Farmers of Africa and South Asia (STRASA), the Cereal Systems Initiative for South Asia (CSISA), and C_4 rice. More than 80 institutes and organizations in India collaborate with IRRI in various areas of rice research.

Conservation and exchange of rice genetic materials

India has contributed 15,865 types of rice to the International Rice Genebank at IRRI, some of which have provided traits such as grassy stunt virus resistance from central Indian rice species *Oryza nivara,* which is useful in developing varieties that are resistant to submergence, salinity, pests, and diseases. In turn, IRRI gives Indian scientists access to its store of genetic materials, as well as those from other countries, for crop improvement. Up to 2010, more than 400 IRRI-bred lines had been either released as varieties for commercial cultivation in India or used in Indian breeding programs through the International Network for Genetic Evaluation of Rice (INGER).

Hybrid rice

For hybrid rice research, India and IRRI's collaboration began in 1980. IRRI's generous supply of hybrid rice breeding materials and its training support for its partners in the national agricultural research and extension systems (NARES) on hybrid rice technology laid a strong foundation for hybrid rice research in India. By 1989, the country had developed a systematic, goal-oriented, and time-bound research program on

"The IRRI-India collaboration is a success story. Through germplasm exchange, hybrid rice development, and capacity building, it helped India enhance its rice production and boosted the country's productivity."

Dr. B.C. Viraktamath, DRR project director

[1] Statistics on rice production in 1950-60 are sourced from www.indiastat.com while those from 1961 to 2009 are from FAOSTAT.

Indian farmers harvested rice on 44,100,000 hectares across the country in 2009.

hybrid rice through a national network project funded by the United Nations Development Programme, the Asian Development Bank, and the World Bank. NARES researchers' concerted efforts, technical backstopping, access to IRRI's genetic materials, and generous funding from donors allowed India to become the second country in the world, after China, to commercialize hybrid rice. The first set of hybrids was released in 1994 and, by 2010, 43 hybrids had been released in the country (see *Hybridizing the world* on pages 32-35 of *Rice Today* Vol. 9, No. 4). More than 70% of these hybrids have either one or both parents bred at IRRI. Because of the effective use of rice breeding materials, hybrid rice has been developed and disseminated rapidly in India. Today, hybrid rice occupies about 1.4 million hectares in the country and is poised for significant growth.

Rice production and management

Collaborative research between India and IRRI has greatly helped in streamlining rice production practices to make rice production not only profitable but also sustainable and environment-friendly. Some of these practices are resource-conserving technologies (laser-aided land leveling, zero or minimum tillage, drill and drum seeding, nitrogen fertilizer management using a leaf color chart), integrated weed management practices for direct-seeded rice, and integrated crop management practices.

The rainfed, lowland, and upland rice research consortia

Rice cultivation in rainfed lowland and upland areas, which is about 18 million hectares (40% of India's 44 million hectares of harvested rice area), faces problems caused by flooding and drought. When rainfed rice research began in 1992, India was recognized as a key partner. It had one rice research center for rainfed upland, two for flood-prone areas, and five for rainfed lowland, along with two other main rice research centers. Under the upland and lowland rice research consortia, mechanisms for tolerance of submergence and drought were explained and tested under the All India Coordinated Trials and rice genetic materials were screened and selected.

Through ICAR and IRRI's close collaboration, *SUB1*—the gene that confers tolerance of submergence—was successfully introduced to high-yielding and popular Indian rice variety Swarna, which later led to the development of Swarna-Sub1 (see *Scuba rice* on pages 26-31 of *Rice Today* Vol. 8, No. 2). Swarna-Sub1 can produce 3–3.5 tons per hectare of rice even if it has been submerged under water for up to 2 weeks. This variety has already been released for commercial cultivation in the Indian states of Orissa and Uttar Pradesh.

Sahbhagi dhan, a drought-tolerant rice variety, is also another innovation resulting from close collaboration between the Central Rainfed and Upland Rice Research Station (CRURRS) and IRRI (see *Making rice less thirsty* on pages 12-15 of *Rice Today* Vol. 8, No. 3). Sahbhagi dhan can survive without water for 10–12 days and has a yield advantage of 0.8 to 1 ton per hectare when drought occurs. Farmers who have tried the variety say that it is very helpful in maintaining rice production despite dry spells.

"IRRI and India have been strategic partners improving the productivity of Indian rice-based systems ever since IRRI was established in 1960. We see India as a very important participant in the new Global Rice Science Partnership (GRiSP) that was recently approved as the first 'mega-program' in the CGIAR reform process."

Dr. Robert Zeigler, IRRI director general

Training and information exchange

More than 1,000 Indian researchers have participated in education and training programs at IRRI. Hundreds of Indian scientists have participated in IRRI's conferences, workshops, and monitoring tours over the years and have helped disseminate rice knowledge.

Toward the future

India will be one of the most important partner countries for the Global Rice Science Partnership (GRiSP). At present, some 170 partnerships exist between IRRI and Indian institutions and organizations. This includes over 40 research institutions belonging to the ICAR system, universities, and others. ICAR will act as a nodal point for GRiSP research activities in India. Science capacity, including scholarships, internships, and short courses, will also be a major component of GRiSP–India collaboration.

IRRI and India promise to work together in the next 10 years—and even beyond—on areas of mutual relevance, in which good science and collaboration will make significant strides. India, with its diverse rice ecologies and large capacity in scientific human resources, will continue to play a key role in IRRI's agenda. India is interested in partnering on initiatives that include C_4 rice. Other areas in which India and IRRI will be working together are innovative public-private partnerships to deliver technologies to farmers through CSISA and rice varieties improved against drought, submergence, and salinity for farmers in rainfed areas through STRASA. IRRI foresees that, in the next 2 years, more stress-tolerant rice varieties that include not only submergence and drought tolerance but also salinity tolerance will be released in India.

Ms. Ferrer is a writer at IRRI.

Rice yield trends in Asia over the past 50 years

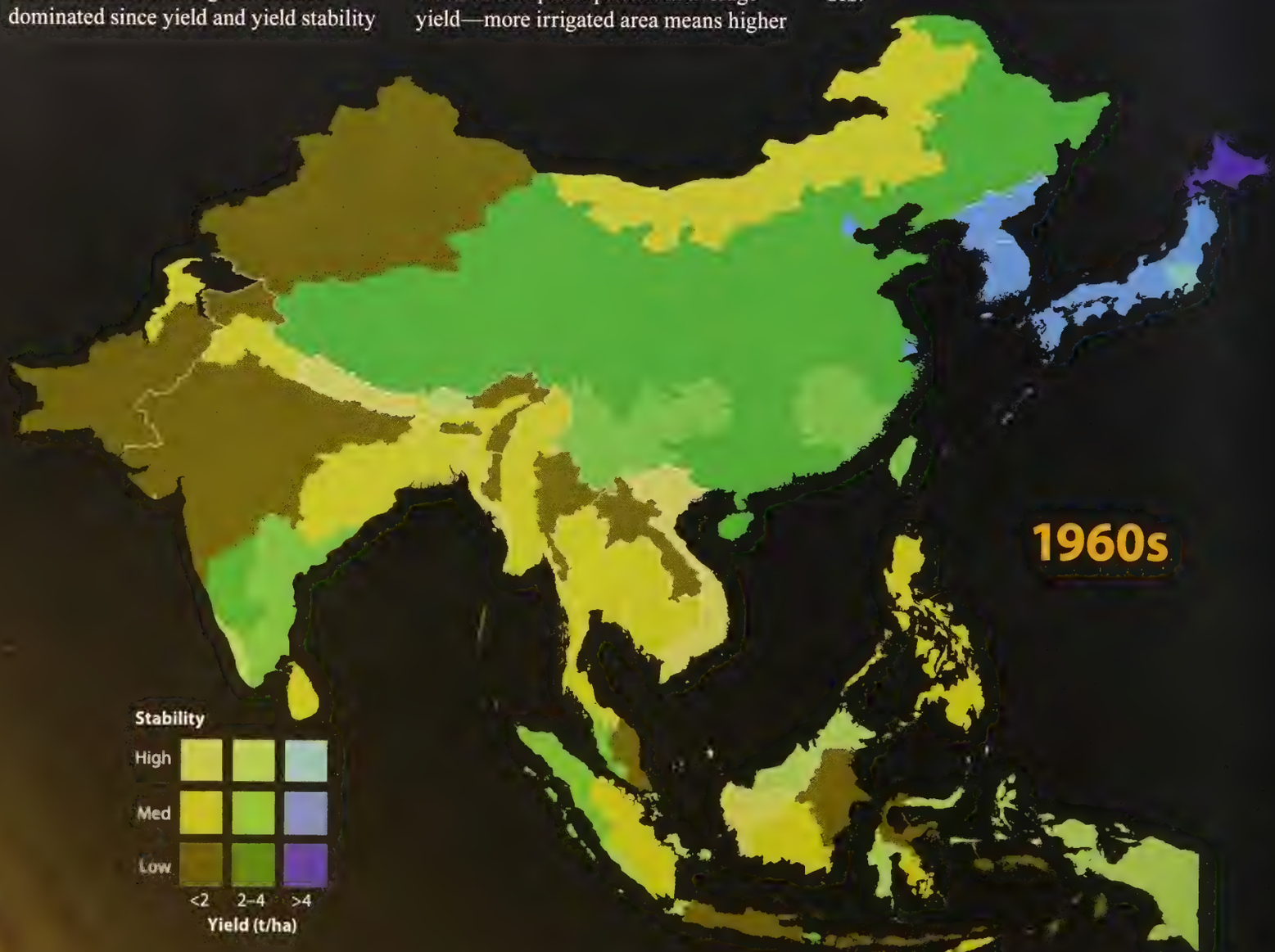
by **Kenneth Bruskiewicz, Arnel Rala, Lorena Villano,** and **Andrew Nelson**

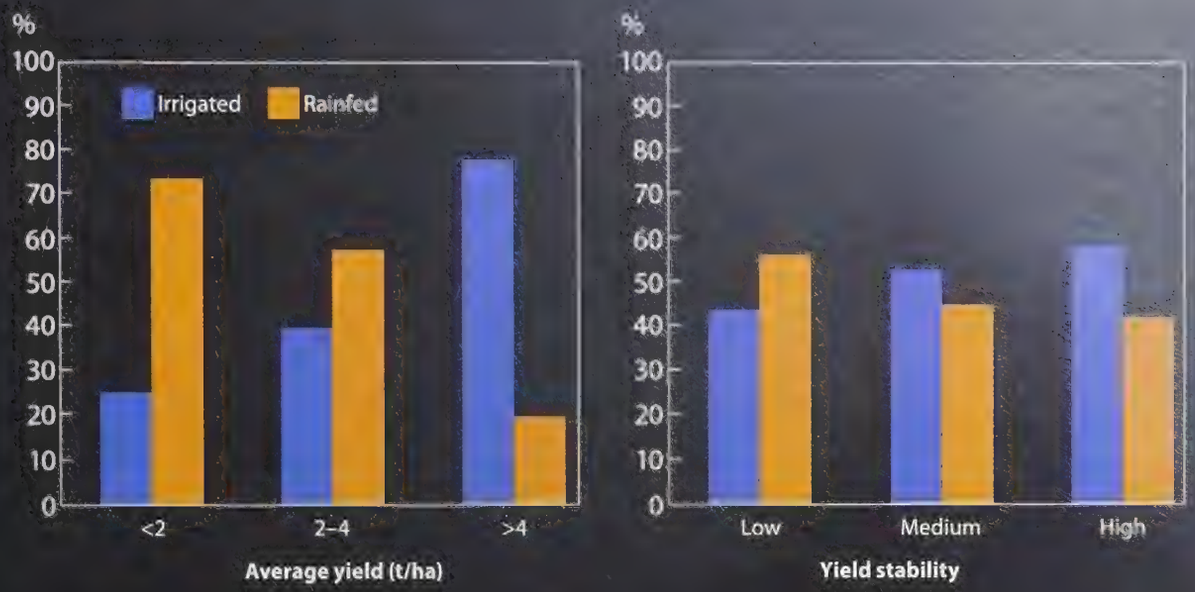
For the past 50 years, rice yield in Asia has generally increased from year to year. However, when we look at stability, the numbers reflect variations in annual yield. The two maps below represent average rice yield and its stability during the 1960s (*bottom left*) and the 2000s (*bottom right*). A bivariate legend represents both these factors in each map. As yield increases, the color changes from brown to green, and then blue. Meanwhile, an increase in stability is represented by the transition of colors from dark to lighter shades.

The maps show the variation in rice yield trends across Asia. In the 1960s, the darker brown and green shades dominated since yield and yield stability were almost uniformly low. In the 2000s, however, these colors turned to lighter green and blue as yield clearly increased. Some regions, though, have stubbornly low interannual stability (darker shades) in yield, and hence in production.

The graphs on the right show the percentage of rice area in Asia in the 2000s that is cultivated under irrigated or rainfed conditions. We calculated these percentages for regions where the average yield was below 2, between 2 and 4, and above 4 tons per hectare (*right*) and for regions where yield stability was either low, medium, or high (*far right*). The presence of irrigation explains much of the spatial pattern in average yield—more irrigated area means higher yield. But, for yield stability, this is less of an issue. Stability from year to year is likely to be more related to other factors that also vary from year to year, such as drought, flooding, and pest and disease outbreaks.

Mr. Bruskiewicz is a student at Brent International School. He is in his graduating year and was a trainee at the IRRI Geographic Information Systems (GIS) lab. Mr. Rala is an associate scientist, while Ms. Villano is a researcher in GIS, Social Sciences Division. Dr. Nelson is a geographer in GIS.





Percentage of rice area under irrigated and rainfed conditions in the 2000s.

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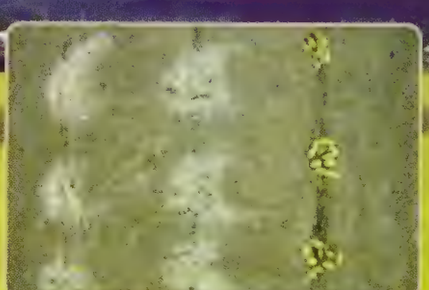
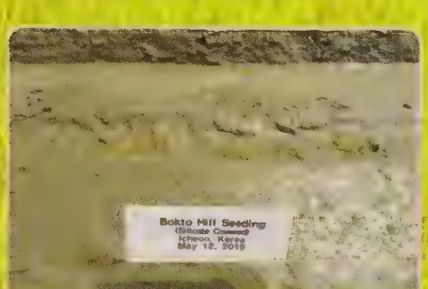
  - It resists bird damage
  - It prevents seeds from drying
  - It overcomes floating or lodging of seedlings under wet direct seeding
- It makes it easy to manage weeds
- It leads to high yield and grain quality

The Bokto Hill Seeder

Wet seeding



Pregerminated seed+silicate



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Greener rice

by **Jauhar Ali** and **Alaric Francis Santiaguel**

Green Super Rice for the Resource-Poor of Africa and Asia aims for environmental breakthroughs in agriculture with rice varieties that are more robust, high-yielding, and disease-resistant, yet thrive with less water, fertilizer, and pesticide

Fears of food shortages following the rice crisis in 2007 and 2008 have prompted a dramatic shift in global trade and in economic and food security policies. Nations have put more focus now on agriculture—a situation somewhat reminiscent of the events that led to the Green Revolution.

A cornerstone of the Green Revolution was the new varieties of cereal crops developed through the efforts of Norman Borlaug, the father of the Green Revolution. One of those varieties is IR8 rice, also known as "miracle rice," developed 40 years ago at the International Rice Research Institute (IRRI). When grown with irrigation and nitrogen-rich fertilizers, IR8 produced more grains than traditional varieties. IR8 changed the world food situation according to Tom Hargrove, a former communicator at IRRI. Indeed, the looming famines did not materialize since miracle rice was introduced, as well as other food varieties (see *Breeding history* on pages 34-38 of *Rice Today* Vol. 5, No. 4).

RICE RESEARCH AND DEVELOPMENT INSTITUTE

DR. JAUHAR Ali, IRRI plant breeder and Green Super Rice (GSR) project coordinator for Asia, shows that GSR varieties perform well under low-input and poor environmental conditions while their yields remain comparable with those of other varieties grown under optimal circumstances.

The high price of a miracle

Modern rice varieties can yield significantly more than traditional rice varieties, but they require more nutrients in order to achieve their maximum yield potential. But, the heavy use of chemical fertilizers can place a toll on the environment. Some 30–80% of the nitrogen applied to farmland escapes and enters water systems and the atmosphere and increases the incidence of some disease vectors[1] according to a paper written by Jules Pretty, professor and pro-vice-chancellor of environment and society at the University of Essex in Colchester, England, as well as author of several books on agricultural sustainability.

Commercial fertilizer to provide nutrients can be an additional cost to farmers if not used strategically such as through site-specific nutrient management (SSNM).

During the Green Revolution, global use of pesticides rapidly increased to protect crops. But, excessive and indiscriminate pesticide use can adversely affect ecosystems and human health.

Endangered water

Agricultural irrigation, another leg on which the revolution stands, has also come under fire. Many experts believe that the global water supply is dwindling fast. Additional pressure from climate change, population growth, pollution, and higher industrial requirements is also contributing to a possible massive water crisis.

It is estimated that rice uses 30% of the fresh water for crops worldwide. In Asia, more than 80% of developed freshwater resources are used for irrigating rice. However, in 2025, it is estimated that 15–20 million hectares of irrigated rice will suffer from some

[1] Pretty J. 2006. Agroecological approaches to agricultural development. Paper contribution to the preparation of the World Development Report 2008, "Agriculture for Development." 35 p.

degree of water scarcity (see *Every drop counts* on pages 17-18 of *Rice Today*, Vol. 8, No. 3). It is therefore critical that we use our water resources wisely and efficiently.

An environment-friendly revolution

Can the world survive without the intensified agricultural practices espoused by the Green Revolution? Can agriculture continue to feed the world with fewer trade-offs?

The key is sustainable agricultural systems, which means producing more output from the same area of land while contributing to the maintenance of clean water, carbon sequestration, flood protection, groundwater recharge, and landscape amenity value, said Prof. Pretty.

Green Super Rice (GSR) for the Resource-Poor of Africa and Asia, a collaborative project between IRRI and the Chinese Academy of Agricultural Sciences (CAAS), offers a sustainable way of producing food for the growing population. Funded by the Bill & Melinda Gates Foundation (BMGF), the project aims to develop rice varieties that retain their stable, sustainable yield potential even when grown with fewer inputs or under unfavorable environmental conditions.

Green super rice

Headed by Zhikang Li, IRRI molecular geneticist who is based at CAAS, the GSR project's breeding technology radically departs from the original approach of the Green Revolution, in which everything else took a back seat to higher yield. Because modern varieties have been bred to respond to the best possible field conditions, they do not reach their maximum yield potential when nutrients, pest management, and water are not optimal. For example, IR64, developed at IRRI and released in 1985, became one of the most popular rice varieties in the world due to its high yield. But, this variety is significantly affected by drought. Through the GSR project, plant breeders have developed rice plants that are drought-tolerant but still have the desirable traits of IR64.

JAUHAR ALI (2)

DR. ZHIKANG Li, IRRI molecular geneticist and head of the GSR project, believes it is possible to combine sustainable food production and environmental preservation through GSR varieties.

After 12 years of rigorous breeding, GSR researchers learned that by subjecting a large number of backcrossed second-generation lines (BC_2F_2) and their succeeding generations to biotic and abiotic stresses, they could eliminate weak lines and identify promising transgressive segregants, which are lines that exceed the performance range of their parents under extreme conditions. They uncovered that this is due to excellent complementation of genetic networks for complex traits, which otherwise are incomplete in both parents.

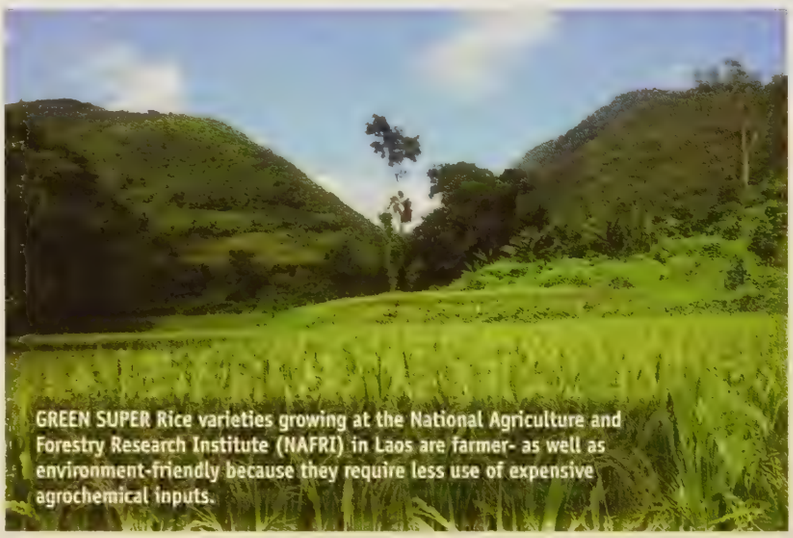
Promising transgressive lines are carefully pyramided for their nonallelic QTLs (or genes located at different loci on the same chromosome or on different chromosomes altogether) derived from different donors for a given complex trait such as drought tolerance into popular varieties such as IR64, Huang Hua Zhan, BR11, and BG300, to name just a few.

A new approach to standard breeding technology

In the past, breeders at IRRI used only three recurrent parents, IR64, Teqing, and IR68552-55-3-2, a new plant type variety backcrossed with 205 donor parents. However, the GSR concept, which was well received and expanded in China under the China National Rice Molecular Breeding Network, uses 46 recurrent parents. Crosses were made with 500 donors, resulting in a bigger pool of available genes—each of which has also been submitted for complete genome re-sequencing to further strengthen the molecular breeding efforts of the GSR project.

At least 18 institutions and 125 molecular breeders are currently involved in this project. Each participating organization in China and IRRI is working with one or two recurrent parents and each one is subjecting all of its advanced backcross breeding populations to insect pests such as planthoppers; diseases such as rice blast, bacterial leaf blight, bacterial leaf streak, sheath blight, and tungro; and abiotic stresses such as drought, salinity, and flooding, among other environmental conditions that limit rice production.

In addition to the BMGF funding, the Chinese government invested more than US$20 million to give researchers the financial muscle to develop and deliver the needed GSR products to Asia and Africa.



GREEN SUPER Rice varieties growing at the National Agriculture and Forestry Research Institute (NAFRI) in Laos are farmer- as well as environment-friendly because they require less use of expensive agrochemical inputs.

[1] McKinsey & Company. 2009. Charting our water future. USA: The 2030 Water Resources Group. 185 p.
Clay J. 2004. World agriculture and the environment: a commodity-by-commodity guide to impacts and practices. Washington, D.C. (USA): Island Press. 570 p.

Doing more with less

Rather than focusing on developing one variety for all, GSR can be custom-made to fit any target ecosystem. For example, GSR varieties can grow rapidly to compete strongly with weeds. Because they establish themselves much faster than the weeds, herbicide—a luxury for poor farmers—becomes unnecessary. These weed-tolerant GSR varieties performed well in field trials in Bangladesh and are now undergoing further testing.

Furthermore, the project has also identified drought-tolerant GSR lines with IR64 as the recurrent parent. For example, IR83142-B-19-B, a GSR line, performs better than Sahbhagi dhan under drought and zero-input (which means no fertilizers and no pesticides, and only one manual weeding) conditions. (See *Making rice less thirsty* on pages 12-15 of *Rice Today* Vol. 8, No. 3.)

Re-packaging agriculture

In 2009, field trials conducted in Indonesia, Vietnam, Laos, Cambodia, Pakistan, Bangladesh, Sri Lanka, and China showed several GSR varieties with different promising traits. Seeds of 56 GSR varieties with multiple resistance to rice blast, rice planthoppers, and gall midge were distributed to the GSR trial countries for more thorough evaluation.

Some 106 GSR varieties are now ready for seed exchange and germplasm distribution through the International Network for the Genetic Evaluation of Rice. These "finished products" include GSR materials that are drought-tolerant and suitable for rainfed lowlands, and inbreds and hybrids with multiple disease and insect pest resistance. GSR-IRRI also released drought-tolerant, salinity-tolerant, submergence-tolerant, and high-yielding varieties suitable for irrigated conditions.

The GSR project also promotes environment-friendly production technology such as SSNM (see *Extension goes mobile* on pages 29-30 of *Rice Today* Vol. 9, No. 4) and integrated crop management (ICM) to go with GSR varieties. SSNM provides information based on simple observations that enable rice farmers to tailor nutrient management to specific field conditions and optimally supply rice with essential nutrients at the right time (see *Balancing fertilizer use and profit* on page 38 of *Rice Today* Vol. 7, No. 1). ICM is a crop production system based on a good understanding of the interactions between biology, environment, and land management. It aims to ensure food production that conserves and even enhances natural resources.

Spreading GSR

The GSR project has held several discussions with policymakers and researchers, and training courses and workshops that focus on the technology. In Sri Lanka, for example, extension and seed agents have already been trained through the project on how GSR varieties can meet the needs of farmers from the target sites.

To ensure that farmers will have a sufficient and steady source of GSR materials, the project has provided training to small- and medium-sized private companies in Bangladesh, Indonesia, Sri Lanka, Vietnam, and Pakistan.

Sowing greener alternatives

In recent years, rice scientists have been forced to face the additional challenge of balancing food security with preserving natural resources and protecting the environment. For IRRI, the key is a doubly green revolution: the development and diffusion of conventional environment-friendly agricultural practices and innovative varieties such as GSR.

"I strongly believe that, through GSR technology, it is possible to realize the highly efficient use of germplasm resources while promoting sustainable agricultural development and protecting the environment for future generations," Dr. Li said.

Prof. Pretty agrees. Productive and sustainable agricultural systems make the best of crop varieties and their agroecological and agronomic management, he said. "This new initiative from IRRI on GSR is welcome as it fits these conditions and needs."

GREEN SUPER RICE
HYBRID RICE SEED PRODUCTION TRAINING COURSE
BANGLADESH RICE RESEARCH INSTITUTE, GAZIPUR
23-25 FEBRUARY 2010

BANGLADESH RICE RESEARCH INSTITUTE

TO PROMOTE and encourage adoption of the GSR concept, the GSR project held several discussions with policymakers and researchers, and training courses and workshops on GSR technology in Bangladesh, Indonesia, Sri Lanka, Vietnam, and Pakistan.

What's cooking?

Sakkarai Pongal

A tasty Tamil confection

Naseema Banu, spouse of Dr. Jauhar Ali, a scientist in the Plant Breeding, Genetics, and Biotechnology Division at the International Rice Research Institute, and a pharmacist herself (she is a life member of the Indian Council of Pharmacy), makes this scrumptious snack for family and guests.

"*Pongal*," she says, "is a harvest festival widely celebrated by Tamil farmers in the Indian state of Tamil Nadu and also in Sri Lanka to give thanks to the sun god for the abundance of their harvest." Pongal, which also marks the first day of Tamizh on the Tamil calendar, means "boiling or spilling over" in the Tamil language. The expression refers to the preparation of Pongal rice, a porridge dish unique to Tamil cuisine and traditionally prepared for the harvest festival.

According to the ritual, rice is boiled with milk and other ingredients in a new clay pot over an open fire. The milk is allowed to boil and spill over the pot to symbolize overflowing abundance and future prosperity for the family.

Ingredients

• Rice (uncooked)	1 cup
• Milk	1 cup
• Grated coconut	½ cup
• Jaggery (unrefined brown sugar)	300 grams
• Green gram or mungbean dhal	50 grams
• Cashews and raisins	20 grams
• Cardamom (crushed)	4 pieces
• Butter	2 tablespoons
• Water	3 ¼ cups

This recipe is good for four people.

Cooking directions

1. Combine the uncooked rice, milk, and dhal in a pressure cooker. Add 3 cups of water and boil for 20–30 minutes until the rice and dhal mixture is cooked. Mash the ingredients thoroughly. Set aside.
2. Mix the jaggery with ¼ cup of water in a heavy-bottomed saucepan and heat it on a low flame until the sugar melts completely. Strain the syrup to remove any impurities.
3. Combine the cooked rice, dhal mixture, and brown sugar syrup while stirring slowly. Add the grated coconut and crushed cardamom. Allow to boil for a few minutes. Set aside.
4. Heat 1 tablespoon of butter in a pan over medium-high heat. Fry the cashews, followed by the raisins, and use them as a garnish.

In a 4:36 video on YouTube at http://snipurl.com/1li8iu, Ms. Banu gives step-by-step instructions on how to prepare this delectable dish.

MUN-HUE HEU

Father of the Korean Green Revolution

by **Kshirod K. Jena**

"Let's increase food production without letting land stand idle," Park Chung-Hee, then president of the Republic of Korea (South Korea), challenged his people in 1961. Following the devastations of the Korean War, the president rallied the country to fight yet another battle—against widespread hunger and malnutrition. Instead of guns and bullets, he aimed to increase its rice production. And, at the forefront of this war was not a highly decorated military general but a scientist named Mun-Hue Heu.

Dr. Heu was a remarkable plant breeder who demonstrated great skills, dedication, and passion for his work. He joined IRRI as a visiting scientist in 1965 and then became a plant breeder from 1980 to 1982. He received encouragement from the then IRRI director general, Robert Chandler, to develop high-yielding rice varieties for South Korea. With IRRI's assistance, Dr. Heu brought the Green Revolution to South Korea. He was, in fact, hailed as the Father of the Korean Green Revolution.

Dr. Heu was instrumental in developing Tong-Il ("reunification")-type rice, a modern variety that helped Korea achieve self-sufficiency in rice production. In 1965, Dr. Heu, while working with Dr. Hank Beachell, then head of IRRI's Plant Breeding Division, made the first cross between Yukara, a japonica variety, and indica variety T(N)1. The first-generation (F_1) plants were designated as IR568. The following year, he made a three-way cross using IR8 (as the female parent) and IR568. The resulting F_1 hybrids were named IR667. Dr. Heu and a team of scientists from Korea's Rural Development Administration (RDA) grew the second-generation (F_2) progenies and made pedigree selections for advancing generations at IRRI. Through the IRRI-RDA shuttle breeding program, the selected progenies were advanced through the F_7 generation. The resulting breeding line, IR667-98-1-2-213-1, was released in Korea as "Tong-Il" in 1973.

The variety, also known as Korea's miracle rice, was short, sturdy, and resistant to many pests and diseases. Its yield potential of 5.13 tons per hectare was 28% higher than that of the japonica variety that was widely cultivated at that time. It was initially released commercially in 1973, followed by other Tong-Il-type varieties that led to Korea's Green Revolution.

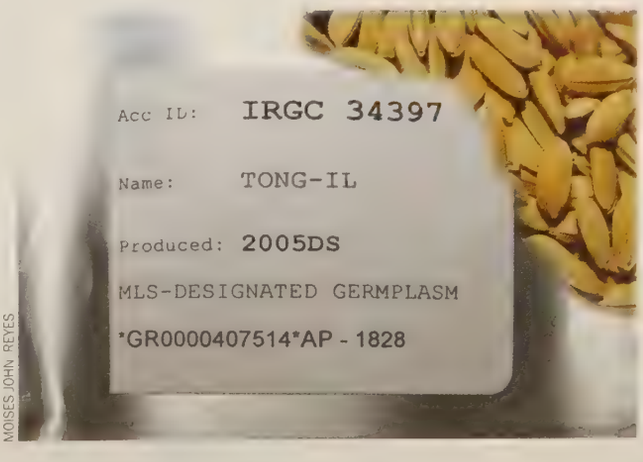
President Park Chung-Hee strongly supported Tong-Il rice and predicted that South Korea would be self-sufficient in rice by 1976 if all rice farmers adopted the variety and new production technologies. The high yield of Tong-Il-type varieties helped boost rice production in the country by as much as 40%. By 1979, Tong-Il-type varieties had increased milled rice production from 3.9 tons per hectare in 1970 to 5.6 tons per hectare, enabling South Korea to achieve self-sufficiency in rice production.

For all its strength, however, the Tong-Il had major weaknesses. The variety was susceptible to rice blast and was not cold tolerant (see *Grappling with cold* on pages 20-23 of *Rice Today* Vol. 9, No. 1). In 1980, a cold snap and an outbreak of the disease created such havoc in rice production that it caused a large shortage. The Tong-Il variety finally disappeared in 1993 after the Korean government ended its program of purchasing rice from farmers and started recommending other rice varieties. Tong-Il is now "just a memory," someone once remarked. But, it certainly did not diminish Dr. Heu's place in his country's recent history.

The development of Tong-Il rice was named as one of the most important scientific achievements in the 20th century in South Korea by *Chosun Ilbo*, one of the country's highly respected newspapers. More importantly, Dr. Heu helped put rice on the table at a time when the Korean people didn't know where their next meal would come from. He also demonstrated the power of plant breeding and unlocked the wide possibilities for the development of modern rice varieties.

"Successful cultivation of Tong-Il-type rice set new milestones for future improvement of rice varieties in Korea and also offered practical opportunities to use indica germplasm in temperate countries,"[1] Dr. Heu wrote.

Dr. Heu passed away on 24 November in Seoul at age 83 with his beloved wife, Hyuk-Mae Kwon, and children at his side. His death was mourned not only by his immediate family but by the whole nation because of the legacy that this legendary scientist left behind. His achievements in agriculture and in improving food security in his country will live forever.



MOISES JOHN REYES

TONG-IL, Korea's "miracle rice," with its yield potential of 5 tons per hectare, played a major role in enabling the country to achieve self-sufficiency in rice production in the 1970s.

[1] **Heu MH, Moon HP. 2010.** History of rice culture in Korea: the origin, antiquity and diffusion. In: Sharma SD, editor. Rice: origin, antiquity and history. Enfield, N.H. (USA): Science Publishers. p 115-153.

IRRI and the World Food Prize: A HIS BO

by **Gene Hettel**

More than 1,100 delegates from around the world gathered in Des Moines, Iowa, last 13-15 October, to honor the 2010 World Food Prize (WFP) laureates David Beckmann and Jo Luck. There were also numerous side-events, including the Norman E. Borlaug International Symposium, which focused on "Taking it to the farmer: reaching the world's smallholders," and recognition of the International Rice Research Institute (IRRI) for its five decades of achievement and its historic bond to numerous WFP laureates.

During the symposium, Ambassador Kenneth Quinn, president of the World Food Prize Foundation, recognized IRRI's 50th anniversary and its long list of achievements. He particularly noted the nine WFP laureates (see box, page 33) who have worked, served, or studied at IRRI, or have partnered with the Institute over the years.

Aryo Feldman and Mariafe Calingacion, two Monsanto Beachell-Borlaug International Program scholars, whom IRRI is currently hosting, attended the gatherings of their 12 fellow Beachell-Borlaug scholars to compare notes on their work. Mr. Feldman (*photo below left*), a British-Indonesian, is involved in IRRI's C_4 rice project, which is looking to introduce characteristics of the C_4 photosynthetic pathway of crops such as maize into rice, which, if achieved, could significantly raise the potential yield of tropical rice. Ms. Calingacion (*photo below center*), a Filipina, is breaking new frontiers in phenotyping to understand the compounds that confer the quality traits of aroma, flavor, and taste in rice.

In addition, an IRRI exhibit displayed posters on the work of Mr. Feldman and Ms. Calingacion, the Institute's historic achievements, its most recent publications, and various historic videos about IRRI, including *A kaleidoscope of achievements, recognition, and opinions, 1960-2010* (http://irri.blip.tv/file/3428017) and a 1994 dialogue between the father of the WFP, Norman Borlaug, and the second laureate, Robert Chandler, about the origins of IRRI (http://youtu.be TW8hpPi0rqI).

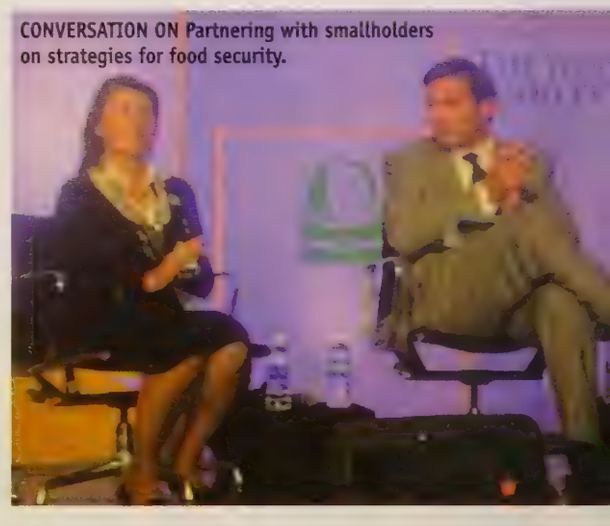
SEVENTEEN VIDEO clips of the WFP events can be found on YouTube at http://irri.org/WFP_videos.

During the Borlaug Dialogue, IRRI Director General Robert Zeigler joined in a conversation on *Partnering with smallholders on strategies for food security* (http://youtu.be/fxzPh-P6MYQ) with (*from left in photo below right*) Gabriela Cruz, a fourth-generation farmer and president of the Portuguese Association for Soil Conservation; Jose Fernandez, U.S. assistant secretary of state for economics, energy, and business affairs; and Matt Kistler (*far right*), senior vice president for sustainability, Wal-Mart. Sean de Cleene, vice president of Yara International, was the moderator.

Dr. Zeigler pointed out, "A vast majority of the world's rice production is supplied by very small-scale farmers—200 million farmers in Asia alone. However, what is extremely exciting from a research institute perspective is that farmers are getting access to tools of communication unlike before. This new accessible means of communication will completely revolutionize smallholder rice production on a global level."

One of the keynote speakers, Jeff Raikes, CEO of the Bill & Melinda Gates Foundation (BMGF), talked about the package of six BMGF grants (totaling just over US$300 million) that span the agricultural value chain. "Two years in, these grants are having a direct impact on hundreds of thousands of farm families and are on track to reach their goals," he stated. The example he gave was the BMGF grant for IRRI's work on submergence-tolerant Sub1 rice. "By the end of this year, more than 400,000 farmers will be planting this rice and, by 2017, more than 20 million farmers will benefit from it, and that is tangible progress!" he added.

Another keynote speaker, Rajiv Shah, United States Agency for



CONVERSATION ON Partnering with smallholders on strategies for food security.

CHRIS QUINTANA (2)

Aryo Feldman

Mariafe Calingacion

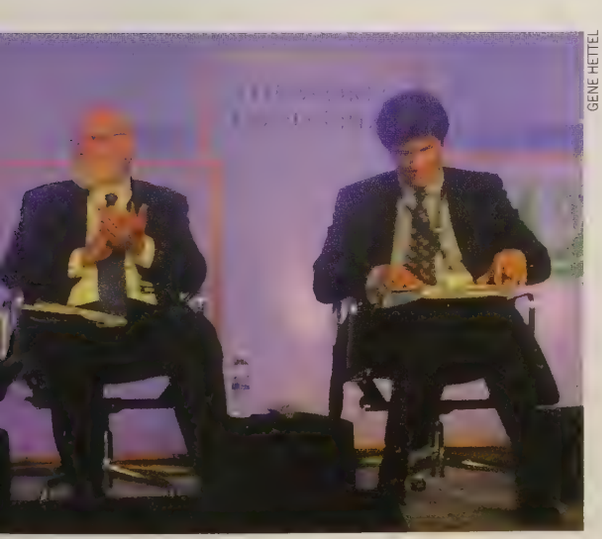
TORIC
ND

IRRI

International Development (USAID) administrator, said, "We are working with the Consultative Group on International Agricultural Research (CGIAR) to support their new 'mega-programs' [of which the Global Rice Science Partnership (GRiSP) will be the first one to be funded starting in January 2011]. These programs focus on high-potential research into new seed varieties, effective agricultural policy reforms, and better water and soil management practices. We have doubled our investment in these mega-programs, making us [USAID] the single largest supporter of the CGIAR."

Also, former U.N. Secretary-General Kofi Annan told the delegates that discrimination against women is hampering the development of agriculture in Africa, his native continent. "We cannot forget that the women who produce most of Africa's food are particularly disadvantaged economically and socially," said Annan, now chairman of the Alliance for a Green Revolution in Africa.

During the WFP ceremonies at the Iowa State Capitol on 14 October, Ms. Lauren Schefter of Mount Vernon, Iowa, was presented with the Elaine Szymoniak Award for her work as an intern at IRRI's Grain Quality, Nutrition, and Postharvest Center during the summer of 2009. Her experiments dealt mainly with sensory characteristics—amylose content, gel temperature, gel consistency, and texture.



GENE HETTEL

The WFP events also provided a venue for a veritable reunion of past IRRI staff members who participated in the keynotes, conversations, and seminars, including M.S. Swaminathan (1987 WFP Laureate and IRRI director general, 1982-88), Gurdev Khush (1996 WFP Laureate and IRRI rice breeder and principal scientist, 1967-2001), Mahabub Hossain (IRRI economist and Social Sciences Division head, 1992-2007), Robert Herdt (IRRI economist, 1973-83), James Hill (IRRI agronomist, 1988-89 and 1999-2002), Ronnie Coffman (IRRI plant breeder, 1971-81), Dennis Garrity (IRRI agronomist, 1981-92), and Prabhu Pingali (IRRI economist, 1987-96).

David Beckmann and Jo Luck received the 2010 World Food Prize for their landmark achievements in building Bread for the World and Heifer International into two of the world's foremost grass-roots organizations leading the charge to end hunger and poverty for millions of people around the globe. In honoring them, the World Food Prize recognizes the critical efforts of NGOs in mobilizing and empowering everyday citizens to end hunger in communities around the world.

Nine World Food Prize Laureates who have worked, served, or studied at IRRI, or have partnered with the Institute

1987: Dr. Monkombu Sambasivan Swaminathan, IRRI director general (1982-88), received the first World Food Prize for spearheading the introduction of high-yielding wheat and rice varieties to India's farmers.

IRRI ARCHIVES (9)

1988: Dr. Robert F. Chandler, Jr., IRRI's first director general (1960-71), was recognized for his leadership in founding IRRI and spurring an international network of agricultural research centers, ultimately the CGIAR.

1994: Dr. Muhammad Yunus, IRRI Board member (1989-94), was recognized for his original approach to promoting the economic and social empowerment of the poorest citizens of Bangladesh, specifically women and children.

1996: Dr. Gurdev Singh Khush, IRRI breeder and principal scientist (1967-2001), and Dr. Henry Beachell, IRRI plant breeder (1963-72), were recognized for their contributions to ensuring that growing populations in Asia and around the world would be supported by sufficient rice supplies.

2002: Dr. Pedro A. Sanchez, who did his PhD thesis work at IRRI in soils (1965-67), was recognized for developing pioneering ways to restore some of the world's poorest and most degraded soils, while offering great hope to all those struggling to survive on marginal lands around the world.

2004: Prof. Yuan Longping, director general of the China National Hybrid Rice Research and Development Center, and Dr. Monty Jones, former senior rice breeder at WARDA (now AfricaRice), both long-time IRRI partners, were recognized for making independent miraculous breakthroughs that bettered the lives of countless human beings.

2006: Dr. Colin A. McClung (*at left* in photo with Robert Chandler), IRRI assistant director (1964-66) and associate director (1967-71), was recognized for his vital role in transforming the Cerrado—a region of vast, once infertile tropical high plains stretching across Brazil—into highly productive cropland.

Volatile markets, cautious traders

by V. Subramanian

Rice traders see a bumpy road in 2011 as financial risks and climate change rocked the markets of 2010

New risk elements and climate change dominated the proceedings of The Rice Trader's (TRT) second World Rice Conference in Phuket, Thailand, 12-14 October 2010. In 2009, the market was rocked by the surge of Philippine demand after Typhoon Ketsana destroyed much of the country's crops. The following year saw more nations struggle with the impacts of climate change. China first battled against drought during the early part of the year, and then with floods. Inclement weather also spread across the Asian region, bringing the worst floods in years to Pakistan and even to Thailand. Untimely rains also affected crop output in Cambodia and Indonesia. These tips in the balance of rice production pushed countries to seek measures that would ensure long-term food security both nationally and regionally. To make things more complicated, fluctuations of the U.S. dollar and euro affected currencies around the world. And, as if that was not enough, Russia and the Black Sea region banned wheat exports, further fracturing the global cereal supply.

Attended by 423 delegates from 42 countries, the conference once again featured extensive analysis of demand and supply scenarios from leading analysts. It also added critical views from major importing countries such as Indonesia, Iraq, the Philippines, and Bangladesh as well as the more commercially oriented views from traders. These traders, who are involved in key African import markets, revealed the concerns of buyers that represent both the public and private sector within the global rice trade. Furthermore, the conference saw the "Big 5" exporters reveal expectations for 2011. Exporters (and millers) from Thailand, Vietnam, Pakistan, the U.S., and India were joined by representatives from the emerging export markets of Myanmar and Cambodia to paint a picture of supply, availability, and export potential, as the audience measured intelligence from both supply and demand to develop views on the possible shape of price, as well as the "critical control points" within the global rice supply chain that need to be watched as supply and availability unfold with each harvest.

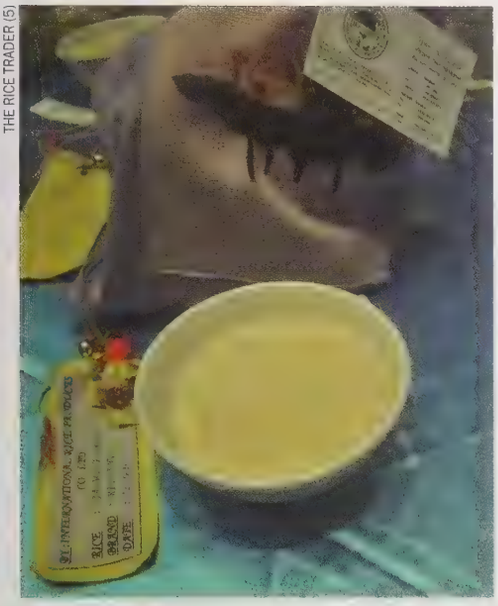
2010 in a nutshell

TRT President/CEO and conference chairman Jeremy Zwinger revealed that 2010 was initially dominated by India's no-show as an importer. He said that India's strategy to risk relying on its own stocks after drought cut its overall rice production for 2009-10 down to 89 million tons from 99 million tons in 2008-09 and bank on recovery from the monsoon in 2010 to boost output back up to a more comfortable level was "one of the biggest bets taken in the history of the rice industry." Consequently, India's decision to stay out of the market sent prices significantly lower—compared to the price hikes induced by the series of Philippine tenders announced in the third quarter of 2009—during the early part of 2010.

In India's place, however, Bangladesh and Indonesia came in with a large demand in tow. This has created a bullish scenario for 2011, even though India's output has recovered on the back of a better monsoon in 2010. Indonesia and Bangladesh are expected to continue to play an active role in 2011 that should heat up the global markets as they purchase strategic stocks and supplies needed to sustain food security requirements and cool local markets where prices have been rising (as was the case for Indonesia in 2010).

Africa, in the meantime, was considered lucky to have stocked up on imported rice during the April to September 2010 period when prices were relatively lower. Interestingly, the dollar and euro revealed more volatility while prices for commodity futures and in energy markets rose during the second half of 2010. The behavior of the European currency showed the impact of debt issues in the region and how the fluctuations have affected the purchasing power of several African nations whose currencies were pegged to the euro. Risk was the key feature that has clouded even the best analyst's crystal ball, making

THE RICE TRADER (5)



INTERNATIONAL RICE & Products Co., Ltd., bagged the World's Best Rice Award 2010 for its Thai jasmine rice.

traders more cautious and reluctant in making buying and stocking decisions.

Experts representing African demand also revealed more caution as African imports and consumption have grown considerably—even through the 2008 rice crisis—partially because of some policy initiatives that reduced the cost of importation and helped maintain rice's affordability among the local population. Notably, trade representatives, such as Olam International, Atlas Trading and Shipping, Export Trading Co., and Regent International, all agreed that African consumers are becoming more sophisticated and are now more sensitive to the quality of their rice.

A changing retail environment that also sees some consolidation in the wholesale sector could offer new opportunities for investors and traders alike. Frédéric Lançon of the French Agricultural Research Centre for International Development (CIRAD), however, expressed concern about the investment challenges in production, marketing, and development of both infrastructure and African consumers (especially the poor who remain affected by higher food costs). He noted that although there is an increase in government and donor interest in supporting investments in rice production after the 2008 food crisis, the real challenge of building infrastructure and marketing (and distribution) channels for African rice, as well as the competitiveness of local production against imported alternatives, would reveal the full extent of Africa's success in the long term.

More support for rice

In its effort to sustain support for rice research and development, TRT donated another US$10,000 to the International Rice Research Institute (IRRI). Mr. Zwinger, who is also the publisher of *Rice Today*, presented the check to Dr. Samarendu Mohanty, head of IRRI's Social Sciences Division, who was also invited as a speaker at the conference.

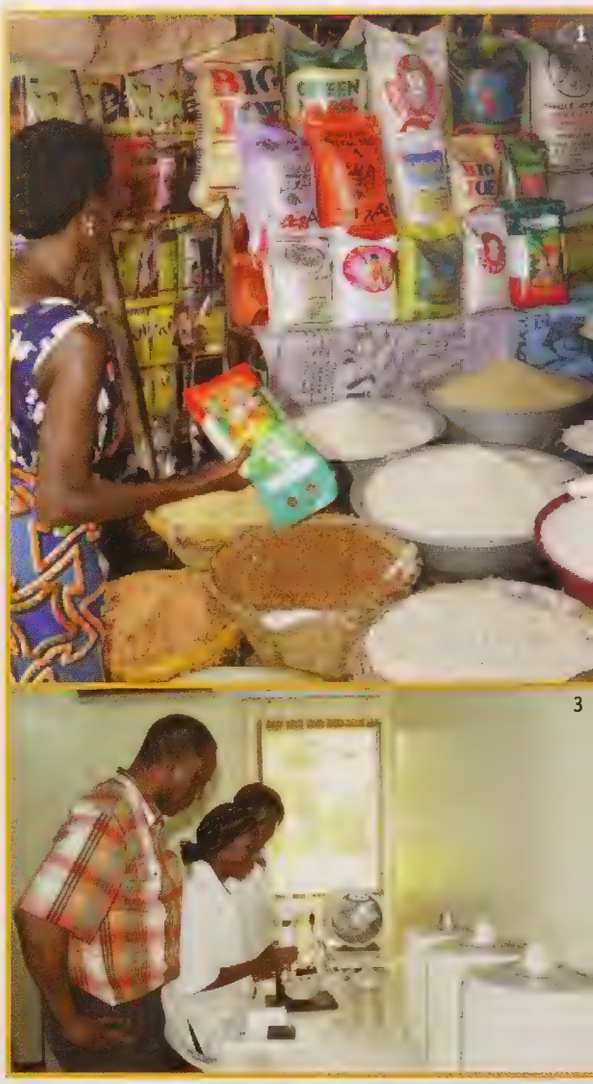
The other highlights of the event were the awarding of the second annual World's Best Rice 2010 competition to International Rice & Products Co., Ltd., Thailand, for its Thai jasmine rice, and the presentation of the Lord of Rice Award to Chef Enrique Diaz.

CHEF ENRIQUE Diaz (*center*) receives the Lord of Rice Award from TRT CEO/President Jeremy Zwinger (*left*) and Mr. Wong King Lun Alan Herman (*right*), who received the World's Best Rice Award 2010 on behalf of International Rice & Products Co., Ltd.

BANGLADESH'S ADDITIONAL Secretary for the Food Division (Ministry of Food and Disaster Management) Abdul Awal Howlader provides insights into Bangladesh's active role in the market in 2010, and even in 2011.

FORMER U.S. Secretary of Agriculture Ed Schafer talks about food security and the role of the rice industry.

Africa shifts its focus to producing quality rice to support local farmers and reduce the region's dependence on rice imports



R. RAMAN, AFRICARICE (1,2,3)

QUA mat

"The rice plant produces only rice seeds; it does not produce sand, stones, or other foreign materials," Dr. Tareke Berhe from Ethiopia wryly observed, referring to the low quality of local rice sold in parts of sub-Saharan Africa.

Dr. Berhe, who has long been associated with rice development in the region, promotes "from plant to plate," an approach that emphasizes the significance of all the components in the rice value chain, namely, input, supply, processing, and marketing.

In Africa, rice has become an increasingly popular food as it is tasty and quick to cook. However, most of the rice eaten on the continent is actually imported from Asia. African-grown rice has failed to compete with imports because large-scale local rice production has been weak and urban consumers have become used to the grain and sensory qualities of imported rice. One of the major challenges for Africa is therefore how to produce sufficient and affordable rice that suits the preferences of its fast-growing and increasingly urbanized population.

Grain quality

In the wake of the food crisis in 2008 that sparked riots in several African cities, several member countries of the Africa Rice Center (AfricaRice) adopted key policy measures recommended by the Center in 2007 to support the rice sector by ensuring farmers' access to high-quality rice seed and other basic farm inputs.

Such support coupled with good weather contributed to an 18% increase in Africa's rice production in 2008 compared with 2007. For the 2009-10 crop season, the Food and Agriculture Organization of the United Nations estimated double-digit growth in rice production in several countries.

"This is good news; however, we should realize that it is not only the quantity but also the quality of African rice that is going to be crucial to allow it to compete with the imported rice from Asia," stated Dr. John Manful, AfricaRice grain quality expert.

According to Dr. Manful, rice research in Africa has mostly focused on the development of technologies to increase production. "But rice, unlike most other cereals, is consumed as a whole grain," he said. "Therefore, its physical properties such as size, shape, uniformity, and look are of utmost importance."

Grain quality does not just depend on the variety of rice, but also on the crop production environment, harvesting, processing, and milling systems. Considerable amounts of rice produced get lost in inefficient postharvest systems in many African countries.

"Quantitative postharvest losses in rice in Africa are estimated to be between 15% and 25%, while qualitative losses, which are estimated by the price differential between imported and locally produced rice, range from 15% to 50%," Dr. Manful explained. "It is important to reduce such losses and ensure a top-quality product that our consumers will want to buy."

Preference for imports

Recent experiences in several countries in the region show that African consumers are becoming more demanding when it comes to their rice. For example, the Benin government has announced that it is planning to sell most of the rice (about 160,000 tons) produced this year to Nigeria, because domestic consumers prefer imported rice.

Similarly, Senegal produced about 500,000 tons of rice in 2009, but most urban consumers considered it inferior to imported rice. In many African countries, the urban populations tend to prefer imported rice. Bags of imported rice dominate shops and restaurants in cities, and local rice is difficult to find.

Locally milled rice is generally of poor quality and is consumed mainly in rural areas. Often, it tends to have stones and people don't have time to clean their rice before cooking it. Even when it is of acceptable quality, it doesn't sell well in cities, where consumers have been used to imported rice. For some people, eating imported rice has become a status symbol.

MAIMOUNA NDOUR, AFR CARICE

1. BRIGHTLY COLORED bags of imported rice dominate shops in many cities across Africa.
2. THE POOR quality of local rice is a major problem faced by rice consumers in many African countries.
3. DR. MANFUL John (*left*), AfricaRice grain quality expert, is passionate about the need to improve the quality of local rice.
4. EXPERIMENTAL AUCTIONS help scientists find out consumers' perceptions about different types of rice and the price they would be willing to pay for them.

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by **Savitri Mohapatra**

Support for local rice

Several countries, however, have started focusing on improving the milling, packaging, and marketing of local rice, and developing public awareness campaigns to promote it. In Ghana, for example, a marketing campaign called "Eat Ghana Rice" was recently launched to encourage people to buy local rice. The successful campaign included advertisements in newspapers, on radio, and on billboards showing the president eating local rice.

With support from USAID, AfricaRice has carried out a series of studies in collaboration with the Nigerian Institute of Social and Economic Research to better understand the factors explaining consumers' shift to imported rice in Nigeria.

Issues related to rice quality and how this affects consumers' preference for local and imported rice were also examined, as local rice was often cheaper by 30% or more than imported rice, mainly because of its lack of cleanliness.

The studies recommended a comprehensive approach to revitalize the Nigerian rice sector by improving the efficiency of operators at the stages of production, processing, and marketing. They emphasized quality and branding to increase the competitiveness of local rice.

The comprehensive strategy was presented to the stakeholders and the Nigerian government. It was integrated as a major component of the country's presidential initiative on rice production, processing, and export in Nigeria, which raised awareness on the need for public support to stimulate rice production and reduce dependence on imports.

Under this initiative, rice imports were subjected to a high import duty (over 100%) and subsidies were provided to facilitate access to seed (50%) and fertilizers (25%).

Partnership with Japan

Since the beginning of its establishment, AfricaRice has given importance to rice postharvest processing and grain quality with support from Japan. The Japan International Cooperation Agency (JICA) helped establish a Grain Quality Laboratory in AfricaRice's headquarters in Côte d'Ivoire and, for many years, JICA postharvest processing and grain quality experts were seconded to AfricaRice. More than 200 national scientists and extension agents were trained in rice postharvest technology and grain quality management under this partnership.

AfricaRice continues to do research on the acceptability of new rice varieties among consumers and the efficiency of processing methods. Farmer-learning videos that address grain quality and processing have been developed and studies have shown their positive impacts on rural women.

As part of its new focus on demand issues, AfricaRice is trying to improve the quality of local rice by collaborating with farmers and processors to develop their capacity for processing, packaging, and branding of local rice.

Local rice auctions

An innovative program by Dr. Matty Demont, AfricaRice economist, and his team in Senegal, in collaboration with the University of Ghent, is conducting experimental auctions to find out consumers' perceptions of the different types of rice and the price they would be willing to pay for them. Most of the women surveyed preferred the local quality rice and are willing to pay more for it.

As a development component of this research, in March 2010, AfricaRice organized a workshop in which stakeholders of the Senegalese rice sector were asked to construct a virtual enterprise with a strategic action plan for bringing a quality rice brand to the market.

Inspired by this experiment, 14 Senegalese rice importers launched a joint venture in November 2010 with producers and processors to promote and market Senegal rice. The company aims to buy all the rice grown in the Senegal River Valley—the main rice-growing area in the country—and then mill it and market it to Senegalese consumers.

"The company is planning to govern quality along the value chain through detailed quality contracts with milling factories and farmers," explained Dr. Demont. "We are happy that our work is helping farmers add value to the local rice, raise farmers' incomes, improve rice quality, and expand the market for locally produced goods."

No rust for rice

by Linda McCandless

DR. HEI Leung (*right*), IRRI scientist, explains the screening of rice germplasm and mutants to understand why rice is resistant to rust species.

Scientists embark on a quest to discover what makes rice resistant to rust disease and replicate the trait in other cereal crops

Wheat gets rust. Maize (corn) gets rust. Also barley, millet, triticale, and oats. In fact, all cereals, except rice, are susceptible to rust.

Rust is a disease that suffocates a plant's photosynthetic process, rendering the crop weak and unable to provide good yields.

Rice, the "stainless steel" among cereal grasses, has long intrigued plant breeders and plant pathologists. Norman Borlaug, the father of the Green Revolution and patriarch of modern wheat varieties, believed that, by discovering the genes that make rice immune to rusts, scientists might be able to introduce these genes into other cereal grains such as wheat and maize.

Quest for discovery

Finding out what makes rice resistant to rust is Hei Leung's quest. This plant pathologist at the International Rice Research Institute (IRRI) in Los Baños, Philippines, focuses his research on rice genetic diversity and discovery, and meeting the needs of future generations for rice genetic resources.

"It's not that rice does not get rust," says Dr. Leung. "Rather, rice does not succumb to the disease even when it encounters the rust pathogen. For most rice accessions, there is no macroscopic evidence of rust colonization. Rice is a true nonhost of most rust species."

Millions of yellow- or rust-colored uredospores (the asexual spores) of more than 4,000 species of rust fungi are borne around the world and carried by the wind and jet stream. They land on a host plant like wheat or maize, germinate, and then grow toward a stomatal pore on the leaf surface to initiate infection.

Rust infections produce red or yellow pustulating uredospores that give infected plants a "rusty" look. In susceptible plants, rust cuts off the plants' ability to photosynthesize nutrients in their leaves and transport nutrients in their stems. Infection by rusts causes stems to weaken and plants to "lodge," or fall over, making what little yield there is nearly impossible to harvest.

A dreaded plant disease

Wheat rust is one of the world's most dreaded plant diseases. A source of plagues since Biblical times, rust devastated the wheat crop in North America as recently as 1953. Since 1998, Ug99, a form of stem rust, has been devastating wheat farmers' fields in East Africa, and is even now marching toward the world's breadbasket in the Middle East and South Asia, particularly India. It threatens to disrupt food security for the millions of people who depend upon wheat as a staple.

In 2010, in Turkey, Iran, Ethiopia, and other countries in Africa, the Middle East, and Asia, stripe rust, or yellow rust, has been the scourge of local farmers, disrupting yields and causing food shortages.

The increasing failure of the world's wheat crop in the face of increasingly virulent forms of wheat rusts such as stem rust and yellow rust has created a renewed interest in the wheat community in examining the one crop—rice—resistant to the terrible disease.

Under the US$26.8 million-funded Durable Rust Resistance in Wheat (DRRW) project, Dr. Leung is now in the third year of the program to explore rice immunity to rust. Financially supported by the Bill & Melinda Gates Foundation and directed by Ronnie Coffman, at Cornell University, the project involves more than 17 institutional partners worldwide.

IRRI RESEARCHER Vance Lacorte (*left*) and Jian Liu, a visiting scholar from China National Rice Research Institute, examine rare mutations that may explain rust resistance.

Team of experts

Dr. Leung's colleagues on the project are spread out across the world: Shiping Wang and Zhensheng Kang at Huazhong Agricultural University and Northwest Agriculture and Forestry University in China, Yinong Yang at Penn State University, Mick Ayliffe at Australia's Commonwealth Scientific and Industrial Research Organisation, Brian Steffenson at the University of Minnesota, and Yue Jin at the United States Department of Agriculture.

All the network partners have critical roles to play in looking for rice mutants that are sensitive to rust. Using microscopic techniques, Dr. Ayliffe in Australia examines how different rust pathogens behave when they land on the rice leaf. Most of the uredospores he observed could germinate and form germ tubes on the rice leaf surface within 12 hours of inoculation. At this time, a few infection sites with a substomatal vesicle could be detected at a low frequency. Dr. Ayliffe observed that the germ tube of the rust fungus penetrated the rice stoma directly without the formation of appressoria. Subsequently, infection hyphae were formed on the substomatal vesicle and the hyphae grew intercellularly in the rice tissue. Although large colonies could be formed in the inoculated rice tissue, the extension of hyphae in rice tissues was limited compared with that observed in wheat leaf tissue.

The next question is whether all rice varieties behave like this. Dr. Steffenson and his team at the University of Minnesota are approaching this question by looking at a large number of rice germplasm accessions maintained in IRRI's genebank. So far, they have evaluated more than 9,000 rice cultivars and landraces for their reaction to a mixture of rust pathogens. None of the accessions tested exhibited any sporulating uredinia, the process in which the erumpent, volcano-like pustules (uredinia) produce and release urediniospores. However, more than 300 accessions exhibited responses similar to those of resistant hosts to the respective rusts, that is, brown or white "flecks" or, in some cases, larger lesions.

RICE MUTANTS that are susceptible to multiple diseases may reveal the genetic basis of immunity to rust.

CHRIS QUINTANA

"In other words, although the rust pathogens can induce a response from the rice plant, they cannot complete their spore-producing life cycle on rice," says Dr. Leung.

A scientific puzzle

In the northwest region of China, yellow rust is the most serious problem for wheat production. For this reason, Drs. Kang and Wang focus on screening rice mutants that are sensitive to yellow rust. They have found that some mutants appear to allow a greater degree of colonization by yellow rust.

The research team's top priority in 2011 is to determine whether susceptibility to rust is genetically controlled. If so, these rust-sensitive mutants could reveal what genetic mechanisms are responsible for the immunity of rice to rust.

Dr. Leung emphasizes that a team approach is important to resolving this scientific puzzle and that it has important practical applications. "Understanding what constitutes long-term immunity is good for all cereals," says Dr. Leung. "We want to discover what genes render rice nonsusceptible to rust. Such a genetic mechanism could also be useful for fighting rice diseases."

Sarah Nell Davidson, the associate director of the DRRW, agrees: "Imparting nonhost resistance to wheat and other cereals could be the ultimate durable solution to the devastating family of rusts."

For farmers, discovering what leads to rust resistance in rice and transferring that knowledge to other crops could lead to stable resistance in wheat and other cereals.

"If we can identify the source of resistance in rice and transfer that to wheat, we will be able to avoid the boom-and-bust rust cycles that are so devastating to food security," says Dr. Leung. "We will be able to take care of Ug99 and, perhaps, future Ug99s."

Ms. McCandless is the director of communications for international programs of the College of Arts and Sciences at Cornell University.

Rat busters

by **Rona Niña Mae Rojas**

IRRI's rodent management team braves the rough mountains of the north to help farmers save their crops from rats

ROLF BOLLER

There was simply no turning back—literally—for the rodent management team from the International Rice Research Institute (IRRI) as the group headed to the remote mountaintop village of Belwang in Sadanga, Mountain Province, Philippines. Flanked by rock walls on one side and a steep drop on the other, the IRRI van carefully traversed the narrow roads that made every turn and swerve along the Cordillera Mountain Range in the Philippines a daring game with fate.

The group was led by rodent ecology expert and Irrigated Rice Research Consortium (IRRC) coordinator Grant Singleton. With him were PhD scholar Nyo Me Htwe and wildlife biologists Harvey Garcia and Vincent Sluydts.

Irony in the terraces

From Sadanga town proper, the IRRI group set out on foot for the village of Belwang. They were accompanied by Rolf Boller, project leader of the Environment and Sustainable Agriculture Program of the Social Action Development Center (SADC) in Bontoc-Lagawe, and also by representatives from the Office of the Provincial Agriculturist-Department of Agriculture (OPA-DA) in Mountain Province.

Under the scorching midday sun, the group had to go through two valleys, walk along the narrow edges of the Sadanga terraces, and climb many steps to the village of Belwang. The sweeping views of the mountain ranges carved with rice terraces hundreds of years old offered a respite from the otherwise arduous trek. The team, however, couldn't help but notice the patches of rice terraces damaged by rats (see *When rats attack* on pages 44-45 of *Rice Today* Vol. 8, No. 4).

The IRRI van carefully navigates through the landslide that blocked the path to home. The narrow road flanked by a mountain wall and a cliff made the trek perilous.

ROLF BOLLER

Belwang village is home to around 115 families who rely heavily on the produce from their land. Their main crop is heirloom rice, the native rice variety of the region (see *The seed keeper's treasure* on pages 12-15 of *Rice Today* Vol. 9, No. 4), which is planted in just one season, from January to March, and harvested from July to September. According to local farmer Banawag Kadatar, the season's harvest is often just enough for their food for the next 6 months. Sometimes, a few farmers manage to plant glutinous rice, which is sold for export.

"The amount of rice yield depends on the size of your land and on whether or not there are rat infestations," says Peter Dicang, a rice farmer. "If our stored rice is not enough, we are forced to buy rice from the National Food Authority using the money we get from selling glutinous rice."

In the midst of the picturesque green surroundings, it is unfortunate that these farmers can barely eke out a living. To augment farmers' income, the SADC and OPA-DA joined forces to help farmers in Belwang establish an agroforestry system.

The outbreak

Through a farmer field school in agroforestry, the village farmers started organic farming of citrus fruits to take advantage of the mountain's soil quality. The village had a successful run in its citrus fruit plantation for 3 years, helping boost farmers' incomes.

Although damages caused by rats were observed in the previous planting seasons, the rats didn't start to attack the village crops on a massive scale until 2009, resulting in heavy losses to both rice and citrus farmers. As many as 27% of the citrus trees were damaged and, by 2010, rice yield losses reached an alarming 30–50%.

DA and SADC then decided to seek help in tackling the chronic problem of rodent infestations. Mr. Boller got in touch with Dr. Singleton and asked him to train the farmers in Belwang.

THE MAJESTIC rice terraces of the Mountain Province often fall victim to gnawing rats. Lighter areas indicate the extent of the crop damage caused by rodents.

GRANT SINGLETON

Rat traps

After two-and-a-half hours of braving the vertical pathways to Belwang, the group was finally welcomed by the villagers.

The group divided into three teams to set up 70 rat traps in and around the village houses, rice terraces, and citrus fruit orchards. The farmers enthusiastically assisted the team in setting up the traps, pointing out areas where rodents were frequently seen. Mr. Boller believes that this activity is a useful hands-on exercise for the farmers in rat-trapping techniques. "It took away their fear from the 'unknown' animal," he shares. "It was an important step towards knowing your 'enemy' first."

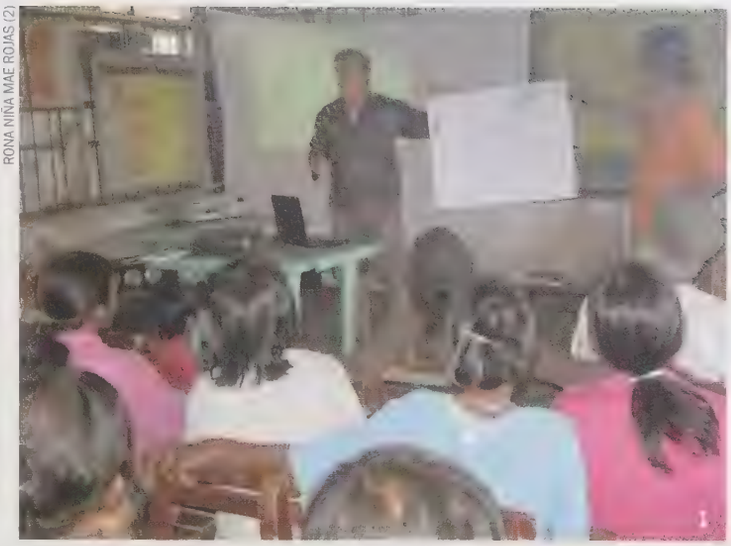
Early the next day, the traps caught five different rat species. Three are pest species (*Rattus tanezumi, R. exulans,* and *Mus musculus*), whereas two *(R. everetti* and *Chrotomys whiteheadi*) are species that are beneficial to rice crops.

The guilty ones

Around 100 people participated in the training course. With inputs from the farmers themselves, Dr. Singleton constructed the farmers' cropping calendar. The interactive course determined the size of the farmers' rice lands, their expected average crop yield, and actual yield after rat infestation. Rodents were identified as the major pest in upland rice production. The participants made a detailed decision analysis of their existing crop management strategies, including rat-trapping methods. All farmers conducted weed clearing of planting areas and blocked burrows during land preparation, maximum tillering, and booting stages of the rice crop. They were introduced to the benefits of community action, synchronous cropping (planting at the same time), good hygiene in fields and houses, and the community trap-barrier system (CTBS). CTBS is a plastic fence surrounding a small plot of rice planted 2–3 weeks earlier than the surrounding crop, with traps set into the plastic. Dr. Singleton emphasized that the methods to control the rat population could be adapted and changed to fit the community's own circumstances.

The farmers eagerly participated during the discussion on the biological characteristics of the pest species, rodent population dynamics, and the possible methods to manage their population. The team explained that the native species *R. everetti* and *C. whiteheadi* are beneficial since they feed on insects, earthworms, and golden apple snails. Some farmers were surprised when they learned that the beneficial species would be freed after the training course. One farmer quickly associated this with the justice system: three pest species were tried and found guilty, but the other beneficial rats did not eat rice and were therefore innocent and free to go.

RONA NINA MAE ROJAS (2)



1. DR. GRANT Singleton (*left*) and Vincent Sluydts (*right*) hold up a sketch of the terraces in Belwang village to draw insights from farmers and help them identify their cropping patterns and practices.
2. HOLDING UP a "good rat" caught during the trapping activity, Dr. Singleton shows the participants the physical characteristics of beneficial species *Rattus everetti.*

A mobilized community

Armed with a better understanding of rodent pest species and the methods to manage them, key farmers and DA officials mapped out an action plan to overcome their current rodent problems. They agreed to act as a community and seek assistance from the local government to buy rat traps. They planned to set these up in and around the village where heavy damage was observed.

For the next cropping season, the farmers will continue their past practices of clearing weeds and blocking burrows in the field and, together, establish a CTBS. Cooperation among them is crucial considering that they need to designate a rice plot as bait to lure rats into it. Rats will follow the plastic fence of the CTBS until they reach a hole that they enter to reach the rice, but instead are caught in a cage trap. The farmers now know that synchronous planting would benefit the whole community because it allows harvesting to happen at the same time, thus limiting food availability for rats. A continuous food supply leads to significant rat population growth.

Another farmer, Dominga Gayaden, explains, "We have to solve our problems together as a community because we are also the ones who are most affected." Her fellow farmers couldn't agree more.

Roadblocks and sunny days

Dr. Singleton and his team acknowledge that more research has to be conducted on the rice terraces of Mountain Province. The rodent management training conducted in Belwang village is simply a start to a continuous learning experience, for both parties. IRRC technologies, such as ecologically based rodent management, are validated by working closely with farmers in what is known as adaptive research. When farmers understand the ecology of the rodent species in their area, they are better equipped to develop effective management strategies. Simple solutions found together as a community could be successful in protecting crops and, in the long run, lead to increased income.

Ms. Rojas is a communication and extension officer with the Irrigated Rice Research Consortium.

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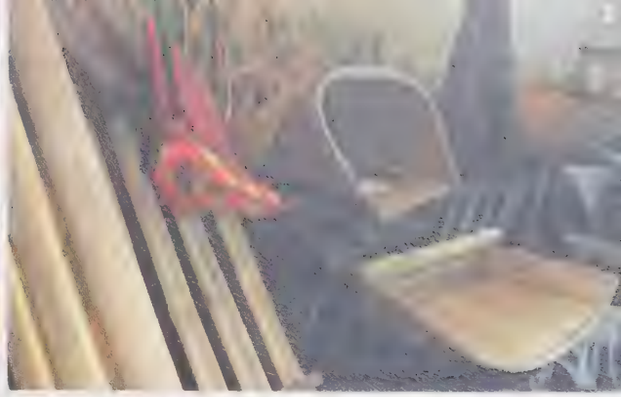
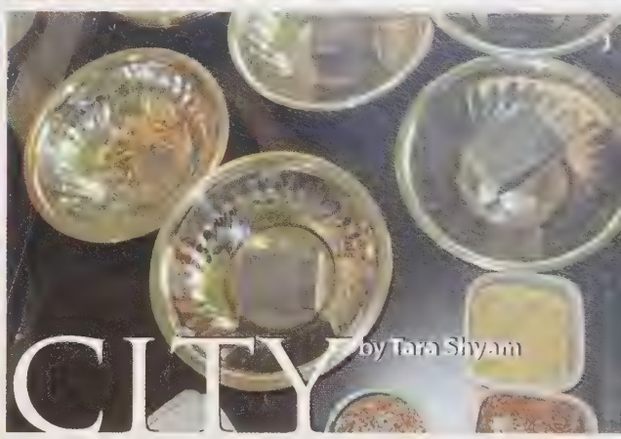




RICE IN THE CITY

by Tara Shyam

Rice may soon thrive once more in urban Singapore

Mention the island country Singapore and rice growing may not be the first activity that springs to mind.

However, like most countries in Asia, rice is an indispensable food grain in Singapore, as it is not only a significant ingredient in local cuisines but it is also an integral part of the small nation's culture and traditions.

In an effort to raise awareness about rice—how this cereal starts as seeds planted in plots to a steaming bowl of rice served in Singaporean dining—the Science Centre Singapore (SCS) and the International Rice Research Institute (IRRI), with support from the Lee Foundation, launched a rice exhibit and education program on World Food Day 2010 on 16 October.

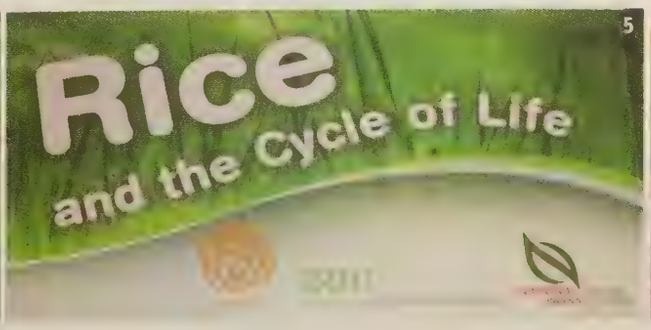
Bearing the theme *Rice and the Cycle of Life*, the exhibit introduced Singaporeans to the rice plant's anatomy, different rice varieties, tools and implements used in rice farming, and consumer products with rice as an ingredient. Visitors also got a chance to dehusk rice grains and create a *rangoli,* a traditional Indian floor decoration made from brightly colored rice flour. Moreover, SCS handed out illustrated booklets about rice and a 5-gram packet of IR64 seeds that included instructions on how to grow rice so people could try planting them at home with the family.

To supplement this informal learning, master teachers of geography from Singapore high schools also attended a training workshop conducted by SCS. Because of this, rice education has been officially incorporated into the school curriculum.

These activities aimed to help Singaporean youngsters understand the relationship between their food and the environment—particularly climate change—and to inspire more young people to become plant scientists. Even though Singapore is a small country that does not grow rice commercially, its next generation of agriculture advocates has much to contribute to the future of rice research.

Ms. Shyam is a development officer with IRRI Fund Singapore.

1. **RANGOLI IS** traditional Indian art made from rice flour that is used to adorn Hindu homes. Elaborate and colorful patterns are used during festive occasions.
2. **RICE FARMING** and sorting implements used in rice production.
3. **MANUAL RICE** dehusking using sandpaper blocks.
4. **A SINGAPOREAN** family tries to dehusk the rice samples at the exhibit.
5. **RICE EXHIBIT** banner displayed at the Science Centre Singapore.
6. **CHILDREN ENJOY** making their own rangoli patterns.



SCIENCE CENTRE SINGAPORE

The global rice market: BOOM OR DOOM?

by **Samarendu Mohanty**

The global rice market is on the move again. In the last few months, rice prices have climbed back up after hitting a 2-year low in early August. The global rice price, represented by Thai 5% broken, had increased by $120 per ton as of 2 December from its August low of $434 per ton—an increase of nearly 30% in 4 months (see Fig. 1). The damage caused by inclement weather on the wet-season rice crop in Pakistan and in other rice-growing countries (Thailand, Myanmar, the Philippines, China, and South Korea) and supply concerns surrounding wheat and maize have provided the necessary spark to reverse the downward trend in the market. Pakistan's rice crop, in particular, has been battered by floods—and the most recent USDA estimate points to a significantly lower production of 5.1 million tons compared with 6.8 million tons in 2009.

On the positive side, Australia is recovering from its multiyear drought, during which the rice crop more or less disappeared in the last 5 years, but it is projected to produce more than 500,000 tons this year or nearly 300% greater than 2009-10 production.

The most recent USDA estimate now puts global rice production at 451 million tons, that is, 9 million tons lower than what was expected a few months ago. Nevertheless, this is still a good harvest considering it is 10 million tons higher than what was produced last year. This year, however, the consumption forecast is above 450 million tons; hence, this leaves nothing for inventory for the first time in 5 years.

Given the tightening of the current global supply-and-demand situation, some strengthening of rice prices was inevitable. Nothing, though, can truly explain such a steep rise in price within just a few months. This was echoed at the International Rice Policy and Investment Conference (IRPIC) held in conjunction with the Third International Rice Congress (IRC2010) in Hanoi, Vietnam, on 8-12 November (see *The rise of rice* on page 16).

More significantly, however, the important question is, Where do prices go from here? As mentioned many times in my previous *Rice Today* articles, nobody can predict future rice prices. If somebody says he can, he is lying. Based on my "guesstimate," further downward revisions of the global rice and wheat supply may provide the necessary support for rice prices at this level, or even take them a little higher. But, Thailand and India can spoil the party and, in fact, exert downward pressure on the price if they decide to unload part of their procurement and mortgage stocks to open up storage space for the new crop.

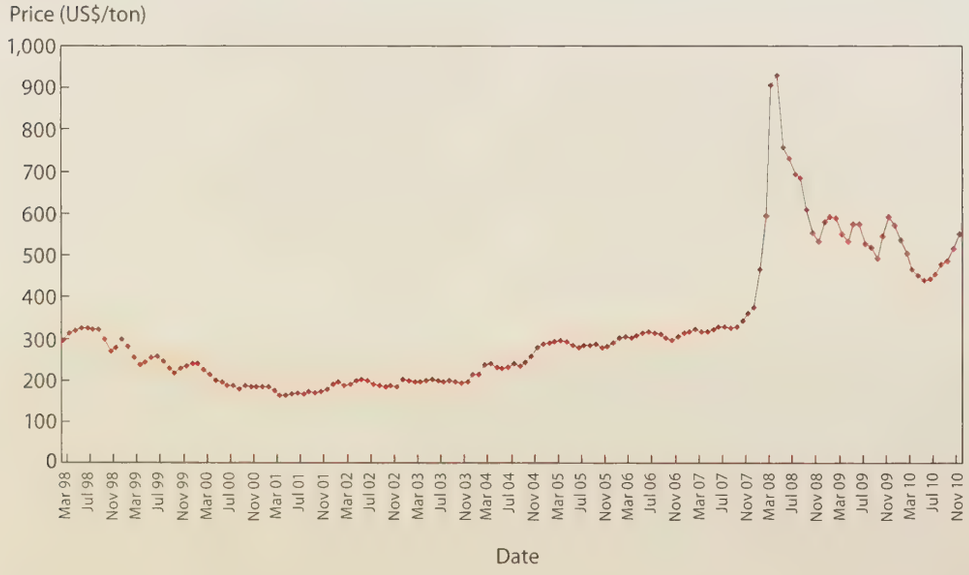


Fig. 1. Price of Thai 5% broken rice (March 1998 to 2 Dec. 2010).

Source of raw data: The Pink Sheet, World Bank, and Thai Rice Exporters Association (for 2 Dec. 2010 price).

Rising market instability

During the IRPIC, many distinguished speakers raised concerns about the growing instability in the global rice market. In the last 12 months, the price for Thai 5% broken rose by $100 twice and dropped by nearly $150 once. Notably, the Thai 5% broken rice price increased by $98 per ton from $493 in October 2009 to $591 in December 2009 and then sank by almost $150 per ton between December 2009 and June 2010. The increased volatility in the global rice market could be partly due to the lingering hangover from the 2007-08 crisis—an overreaction of the market to supply-and-demand shock. Many also contend that the rising involvement of the government in trade since the 2007-08 rice crisis has added instability to the market because of a lack of openness in terms of trade. In most government deals, the prices paid and received for rice are kept under wrap. Traders have also started speculating on possible border policy shifts in major exporting and importing countries, thus generating more volatility in the market.

To gauge the degree of instability in the rice market, let's look at current global wheat production that has been severely curtailed by weather problems in the major exporting countries such as Russia, Ukraine, Kazakhstan, and Canada. The 2010-11 global wheat production is estimated to be 45 million tons lower than the previous year's 680 million tons, a drop of nearly 7%. In response, wheat prices have gone up to a level that is more appropriate for the lower available exportable supplies in major growing regions. Interestingly, a similar drop in global rice production in the major exporting countries, that is, a production shortfall of 30 million tons in Thailand, Vietnam, Pakistan, the United States, and India, would have caused mayhem in the global rice market, similar to what was witnessed in 2007-08 when rice prices rose to an unprecedented $1,000 per ton.

Rising price volatility for rice, a staple for half of the world's population and a source of livelihood for nearly a billion households, is also undesirable from the global food security perspective. As reported by Susanne, Keil, and Zeller,

many past studies have established negative effects of price volatility on poverty reduction and agricultural productivity in low-income countries.[1] This was evident during the 2008 food crisis when the number of people living below the poverty line increased by 100 million. Interestingly, when prices dropped in 2009, the poverty figure also declined. In Bangladesh, poverty headcount increased from 41.5% in 2006-07 to 45.9% in 2007-08 due to higher food prices.[2] Moreover, volatility in rice prices also creates uncertainty in farmers' expected earnings, making them cautious in applying fertilizer, irrigation, and other necessary inputs, which negatively affects yield. The 2008 wet-season crop is a good example, in which farmers responded to high rice prices by applying expensive fertilizers to boost production but then ended up with lesser values for their crops because of the meltdown in commodity prices in the last quarter of 2008. During this period, rice prices dropped by a whopping $500 per ton and fertilizer prices, particularly for urea and ammonia, also plummeted by more than 60%.

What can be done realistically?

First of all, one would like to see the free flow of rice across countries or regions without much government intervention as the size of the market is inversely linked to the level of volatility. In other words, a larger market is likely to absorb any shock better than a smaller market where prices will have to move farther up and down in response to any shock. However, considering the sensitivity of rice in rice-growing regions, it will be more realistic to take a few baby steps first toward fostering a market that has freer trade and less government intervention. Such development will also encourage countries to move away from short-term fixes to more long-term sustainable development of infrastructure, markets, policies, and technology.

As a first step toward stabilizing the global market, importing nations should not rush to secure domestic supply needs for the entire year at one time. The creation of a strategic rice reserve as a means for market stabilization has also picked up steam since the 2008 rice crisis. The objective of this reserve will be to keep the rice price in a desired band by procuring rice when the price falls below the lower limit and releasing the stored rice to the market when the price goes above the upper limit. This may sound simple and effective in managing market volatility and restoring the faith of importers, but the actual operation of such a reserve can be very expensive and controversial. For example, when the price is low, the procurement of rice by the strategic reserve to raise the price will not be acceptable to importing countries. Similarly, when the price is high, exporters will object to the release of rice from the reserve to lower the price.

There has also been talk about developing a rice futures market to provide a platform for exporters and importers to hedge against price risk. The futures market should also help in improving the transparency of the price formation process. However, one of the major stumbling blocks in having a feasible global and regional futures market is the high degree of product differentiation in rice at both origin and destination. For example, Pakistani or Indian basmati rice is very different from Vietnam 25% broken rice or japonica rice from East Asia. Even within a country, prices of different types of rice are not always highly correlated, as shown in Figure 2 for Thai Hom Mali Grade A and Thai 5% broken rice. Such differentiation of rice makes it extremely difficult to have a rice futures contract that will enable producers/traders of different types of rice to hedge against the price risk they face.

Looking ahead

Global rice demand is projected to grow at 1.2–1.5% each year in the medium term. Assuming there will be no further expansion in rice area, which is already at an all-time high, the current yield growth of less than 1% will likely create a tight supply and demand situation more often than ever before. In addition, more frequent extreme weather because of climate change is expected to make the supply-demand imbalance even worse. On top of that, protectionist policy measures taken by rice-growing countries in the last few years are likely to complicate the market further. As indicated earlier, no silver bullet can fix this problem and baby steps should be taken to expand the trade volume and make it more transparent. Different options, including the viability of a strategic reserve and a futures market, should be examined in great detail to determine whether or not they will be effective for market stabilization.

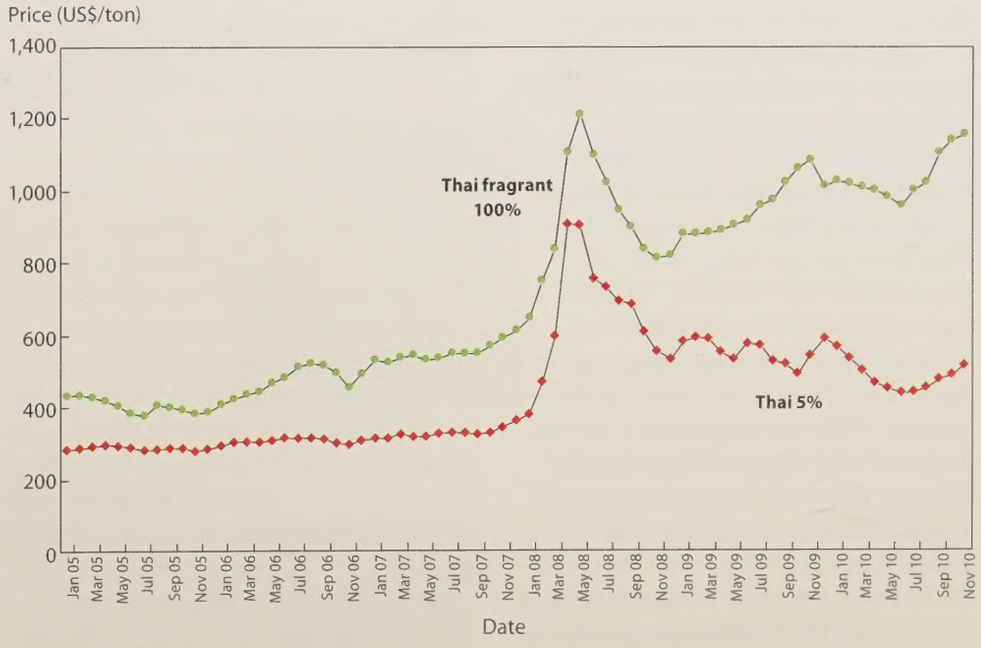


Fig. 2. Prices of Thai fragrant 100% and Thai 5% broken rice (January 2005-November 2010).
Source of raw data: The Pink Sheet, World Bank, and Rice Market Monitor, Food and Agriculture Organization.

[1] Susanne U, Keil A, Zeller M. 2010. The impact of rice and maize price volatility on farm households' income and consumption in northern Vietnam, Conference on International Research on Food Security, Natural Resource Management and Rural Development held in Zurich, 14-16 September 2010.
[2] Raihan S, Haque AKI, Khan EA, Chowdhury R. 2008. Updating poverty estimates in Bangladesh: a methodological note. Bangladesh Econ. Outlook 1(4).

The new global rice agenda: a Latin American perspective

BY: GONZALO ZORRILLA

Latin America has a tiny share in global rice production—only around 4% of the total. Now, rice is the most essential crop in almost all countries, not only as a staple food but also as a significant sector that contributes to economic growth and job creation. And, compared with other food grains, it is clearly more important in the diet of the poor.

Latin America is vastly diverse in its ecosystems for rice production. From the small farmers in coastal Ecuador or Guyana who continue to transplant or pregerminate seeds to the extensive rice growers in the Southern Cone (Argentina, southern Brazil, and Uruguay) who use high-tech no-till direct-seeding systems; from the hilly-upland subsistence farmers in the Andean region of Bolivia or northern Nicaragua to commercial producers in the rainfed Eastern Plains of Colombia or Costa Rica, there are all kinds of intermediate ecosystems and forms of production.

International research has played a key role in improving rice production in the last 40 years, starting with the semidwarf materials developed during the Green Revolution in the late 1960s. Joint efforts of the International Rice Research Institute (IRRI) and the International Center for Tropical Agriculture (CIAT) were the driving force behind this revolutionary trend in agriculture. During the 1980s, strong national institutions appeared in several countries and helped create a regional network for research and development in rice. This concerted effort was consolidated in 1995 with the foundation of the Latin American Fund for Irrigated Rice (FLAR) as a public-private regional partnership based at CIAT. With FLAR's support and the active involvement of farmers' organizations, Latin America is working on a second Green Revolution in the region based on crop management and good agronomic practices (see *Rice Revolutions in Latin America* on page 38 of *Rice Today* Vol. 6, No. 2). International, regional, and local efforts have led to a continuous and dynamic improvement in rice production in Latin America—with the region demonstrating high yield growth in the last three decades.

Plugging Latin America into this global rice research agenda, coordinated by IRRI, will help the region improve rice production and meet its own local demand, as well as the world's.

Since the late 1990s, however, collaboration among international centers and other institutions from different regions has declined steadily. IRRI's support for Latin America diminished and contact with the African centers became minimal. But, in 2009, changes in the international centers' governance sparked a revival of communication among centers. Institutes then started discussing and elaborating the program that has now come to be known as the Global Rice Science Partnership (GRiSP). This program provides an opportune time to re-engage Latin America as an active partner in the strategy to overcome the huge challenges facing world rice production—allowing the region to not only receive new scientific breakthroughs but also to share some of the interesting technology and production systems that Latin American farmers have already validated and adopted.

Investment in rice research in Latin America is very small compared with that in Asia and Africa. Hence, we anticipate that this partnership will bring in new and suitable technologies to the region. In turn, because urbanization across the world has limited agricultural expansion, Latin America could provide additional rice area to boost rice production since it is one of the few regions left in the world that still has plenty of natural resources, especially land and water.

Research programs at CIAT, FLAR, and several national institutes have accomplished good technological advances that could also be shared in this new global agenda. Strategies to increase yield potential in conventional varieties, using wild species to develop new improved cultivars, biotechnology breeding tools, rice transformation with a high-throughput platform, agronomy extension programs aimed at closing the yield gap, improving water-use efficiency, minimum- or no-till and direct-seeding systems, institutional innovations such as FLAR, among others, are areas that have good and validated technological products that may be useful on other continents.

FLAR, along with its more than 30 public- and private-associated institutions in 17 Latin American countries, is ready and eager to play an active role in this new global platform. While CIAT will be fully engaged in genetics, biotechnology, disease, and climate change research issues among others, FLAR, with its grass-roots network of local institutions, will focus on applied research and act as a bridge in bringing these new technologies to farmers.

Plugging Latin America into this global rice research agenda, coordinated by IRRI, will help the region improve rice production and meet its own local demand, as well as the world's. It will also provide Asia and Africa with valid experiences and research products, which they can adopt and apply to their respective strategies.

Mr. Zorrilla is the executive director of FLAR.

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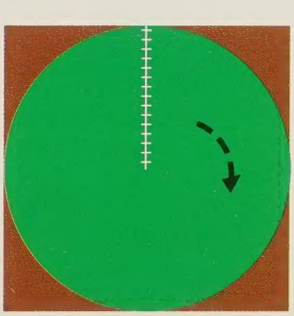
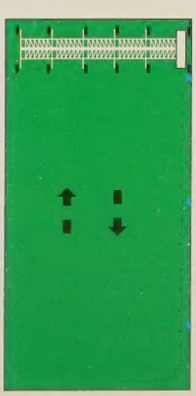


Valley Center Pivots rotate around a fixed pivot point in the center of the field. The machine efficiently irrigates the crop while creating a circular pattern.



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